Safecracking 101

A beginner's guid to safe manipulation and drilling

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IMPORTANT! READ BEFORE CONTINUING:

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Introduction To Safe Manipulation

Among the number of prestigious skills attainable as a locksmith is that of the safe technician. Erroneously called safecrackers or safe busters, true safe technicians spend years mastering a skill set of which few are capable.

For those considering a career in safe servicing, this guide serves as an introduction into a few of the necessary principles and skill sets that must be learned and developed in this trade.

Among the best safes for learning safe manipulation concepts and techniques, Sentry is at the top of the list. Designed for fire protection, the locking system (i.e. boltwork, fence and wheel pack) can be easily manipulated by the locksmith, making his first adventures into safe work a triumphant one. Once the techniques needed to manipulate open a Sentry safe are mastered, learning the necessary techniques to open the more sophisticated Group II lock is a simple and logical next step.

Through this small manual, we learn how to quickly and easily manipulate open an early model Sentry safe using a simple manipulation technique and the Saber Sentry manipulation aid. Before discussing the technique and use of the tool, however, we are first introduced to the necessary definitions, descriptions and explanations needed to understand manipulation. By the end of this manual we will have an understanding of boltwork, direct drive, fence, gate, false gate, moveable fly, drive pin, fixed fly, combination wheel, drive cam, wheel pack and wheel action as it relates to a Sentry style safe.

Chapter One: Sentry Boltwork

Chapter Goals:

In this chapter we are introduced to the components of the two most common Sentry safe locking systems: the single bolt system and the active four bolt system. In the process you will learn the meaning of the terms boltwork, direct drive, bolt, handle, handle cam, wheel pack, dial, spindle, drive cam, fence and gates. Study to learn these components and terms well.

Boltwork refers to the various pieces or components used for locking and unlocking a safe. For the better part of Sentry's existence, their safes utilized a single bolt locking system, still common today. The boltwork in this system is comprised of the bolt, handle, handle cam, fence, dial and wheel pack. These components work jointly for locking and unlocking the safe. (Photograph 1.)

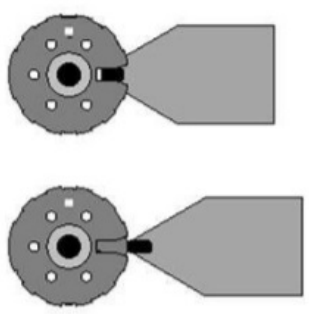
1. The single-bolt system by Sentry is the most common one seen in the field today.

The newest boltwork to the Sentry line is the active four bolt system. In this system, there are two bolt assemblies (one for each side of the door). Each bolt assembly is comprised of a die cast rod with a bolt at each end. Also included in the boltwork is an opening handle, handle cam, fence, dial and wheel pack; as well as a large spring that serves to return the handle to a rigid, horizontal position. (Photograph 2.) Despite their obvious design differences, the components of each Sentry boltwork system are similar in nature and function.

2. The four-point boltwork is the newest in Sentry's line.

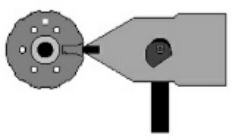
In opening either style safe, the combination is entered using the dial. When the combination is correctly entered, small slots or spaces, called gates, on the tumblers or wheels of the wheel pack, align in front of the fence. As the opening handle is rotated, the handle cam is turned, forcing the fence into the wheel pack and retracting the bolt(s). Because the gates provide an open space into which the fence can travel, the bolt(s) continue to retract until the safe door is unlocked.

Should a gate on any one of the wheels not align with the fence, the fence is blocked from traveling far enough to allow the bolt(s) to fully retract, thus keeping the safe door locked. (Illustration 3.)



3. By aligning the gates of the wheels in front of the fence, the fence and the bolt are allowed to move far enough to retract the bolt. If a gate from even a single wheel does not align with the fence, the bolt cannot be retracted.

Notice in both models, that as the handle is turned to retract the bolt(s), the fence is forced directly into the wheel pack. This is called a direct drive lock or boltwork. (Illustration 4.) When applying too much turning force to the handle of a direct drive lock, the pressure of the fence against the wheel pack can prevent the wheels of the wheel pack from turning. On the other hand, by applying varying degrees of force against the handle, the pressure of the fence against the wheel pack allows us to feel the movement of the rotating wheels of the wheel pack through the handle. We will later find that this pressure and feel of the wheel pack are important in being able to manipulate the Sentry safe open.



4. In a direct drive safe, the opening handle moves the fence directly into the wheel pack.

As seen, there are very few components to keep a safe technician from opening the Sentry safe. In fact, there are only three conditions that prevent a Sentry safe from opening:

1. Operator Error - either a lost or incorrectly entered combination.

2. Boltwork Failure - one or more of the boltwork components is damaged, missing or inoperable. This is often the result of a burglary attempt.

3. Environment - the door is fused shut due to rust, chemical corrosion, or fire damage; the hinges are worn, or an article is jammed in the door opening or boltwork, preventing proper operation.

Conclusion:

The boltwork of a Sentry safe is

comprised of the bolt(s), handle, handle cam, fence, wheel pack and dial. To open a Sentry safe, the correct combination is properly dialed, causing the gates of the wheels to align in front of the fence. Once the gates are properly aligned, the handle can be turned to retract the bolt(s).

Only three conditions prevent a safe from being opened - Operator Error, Boltwork Failure and Environment. As a safe technician, then, we need only determine the cause of in-operation to decide on the proper course of action for opening. The rest of this manual teaches the methods and techniques necessary for opening a Sentry safe through manipulation and proper drilling.

NOTE: A Word About Drive Cams

It should be noted that throughout Sentry's history, design changes have affected both the components and their nomenclature.

The most notable is the use of the term "Drive Cam." Drive cam in most safe lock applications refers to the smaller wheel attached to the end of the spindle. Its purpose is twofold: To transfer the rotation of the dial to the wheels of the wheel pack, and to hold the fence off of the wheel pack until the correct combination is entered. Once the correct combination is entered, the drive cam serves to retract the lock bolt.

While the name is the same, the function of the drive cam in Sentry safes does not affect the action of the fence or lock bolt in any way. Its sole purpose is to connect the spindle to the third wheel.

In their earliest designs, Sentry safes did not utilize a drive cam. Instead, the third wheel was driven directly by the spindle. In essence, this third wheel was a drive wheel.

Also typical of the early Sentry safes was the use of a screw that served both for changing combinations and as the drive pin of the third or drive wheel.

The terminology introduced and used throughout this manual reflects the

components and nomenclature used by early model Sentry safes.

Chapter Two: The Wheel Pack

Manipulating a safe is one of the finest skills a locksmith can possess. Critical to manipulating a safe is a thorough understanding of the wheel pack. While the boltwork is central to the locking of a safe, the wheel pack is the heartbeat of the boltwork. Understanding how and why it operates is central to making a surreptitious entry. Once we understand the characteristics of the Sentry wheel pack, we can develop a better understanding of how to use those characteristics to manipulate the safe open.

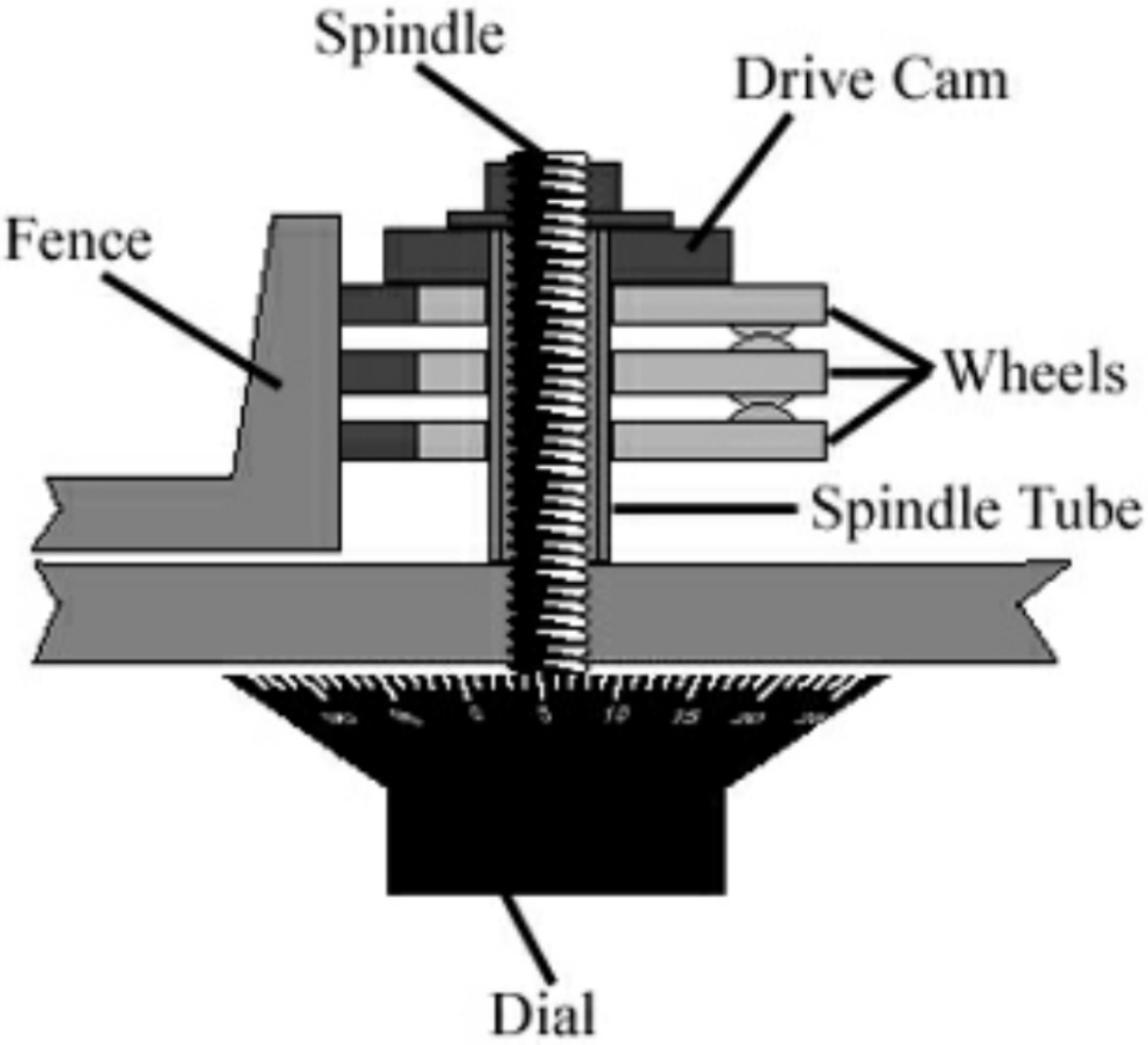
Chapter goals:

This chapter introduces the Sentry wheel pack and its operation. Important are the components of the wheel pack and their characteristics. Terms included in this chapter are dial, spindle, spindle tube, chassis, drive cam, fence, tumblers, combination wheels, gates, false gates, drive pins, fixed fly, moveable fly, and wheel action.

This chapter is divided into three sections: Wheel Pack Components And Definitions, Combination Wheel Specifications, and Wheel Action. Learn each section completely. It is critical to successful Sentry Safe Opening.

Wheel Pack Components And Definitions

The wheel pack is made up of several individual components, each having their own set of characteristics. (Illustration 5.)



5. The various components of the wheel pack.

Dial - a large plastic knob with numbers surrounding its circumference, found on the exterior of the safe door. By properly rotating the dial, a combination can be entered, allowing the safe to be opened. The Sentry dial is numbered from "0" to "99." This means that 50 numbers in either direction is the halfway point of the dial.

Spindle - a shaft that connects and transfers the turning of the dial to the wheels of the wheel pack.

The spindle is fastened to the center of the dial by a hidden screw at the center of the dial. The spindle passes into the safe through the spindle tube where it is attached to the third wheel of the wheel pack by a drive cam.

The end of the spindle (inside the safe) is square and mates with the square inside hub of the drive cam. On older version safes, the spindle mated directly to the square hub of the third wheel which then served as the drive cam.

Spindle Tube - a tube in the wall of the safe allowing the spindle to enter

into the safe where it is connected to the wheel pack. This tube prevents the insulation dust from entering the lock cavity.

Chassis - used in late model Sentry safes only, the chassis is the base on which all the other components are assembled.

The chassis is made of two parts. A base that is used for attaching the wheel pack to the safe through the use of three mounting screws. And a spindle tube on which the combination wheels are placed and rotate, and through which the spindle passes into the safe.

Once the combination wheels are placed on the spindle tube, a plastic bushing or washer is glued to the end of the tube to prevent the combination wheels from being removed. In older units, the spindle tube was an integral part of the safe door and allowed the combination wheels to be removed.

Drive Cam - Used on late model safes, the drive cam connects the spindle to the third wheel or tumbler of the wheel

pack, allowing the turning of the dial to turn the wheels of the wheel pack. It is also used to determine and change the combination of the safe. Earlier models incorporated a screw change design. (See page 6 for an explanation on Drive Cam usage.)

Tumblers or Combination Wheels - used interchangeably, the tumblers or combination wheels are the circular disks or interdependent wheels that form the locking mechanism of the wheel pack. Combination wheel or wheel is the most common term used in the trade. Tumbler is typically used in describing the combination wheel to a layman.

Fence - a metal post or bar that lays across the edges of the three combination wheels.

Gate - a slot or open space in a combination wheel that creates the opening into which the fence enters when opening a safe. Sometimes referred to as the true gate. (Illustration 6.)

6. Components of the wheels.

False Gate - one of a number of small notches around the perimeter of a combination wheel, used to make manipulation of a safe more difficult by imitating the feel or presence of a true gate.

Drive Pin - the tab or pin on a rotating combination wheel, used to make contact or pick up the fly and drive or rotate an adjacent combination wheel.

Fly - a tab or pin on a combination wheel that is contacted or picked up by the rotating adjacent driver pin, causing the wheel to rotate.

Moveable Fly - a fly designed to move or rotate in either direction when contacted or picked up by the drive pin of the adjacent combination wheel.

The slight rotation of the moveable fly allows for entering the combination in either direction.

Fixed Fly - a fly that is an integral part of the wheel(s). It is rigid and does not move or rotate when it is contacted or

picked up by the drive pin of the adjacent combination wheel.

Because a fixed fly does not move or rotate, a set combination must be entered in the same direction on all attempts if it is to work.

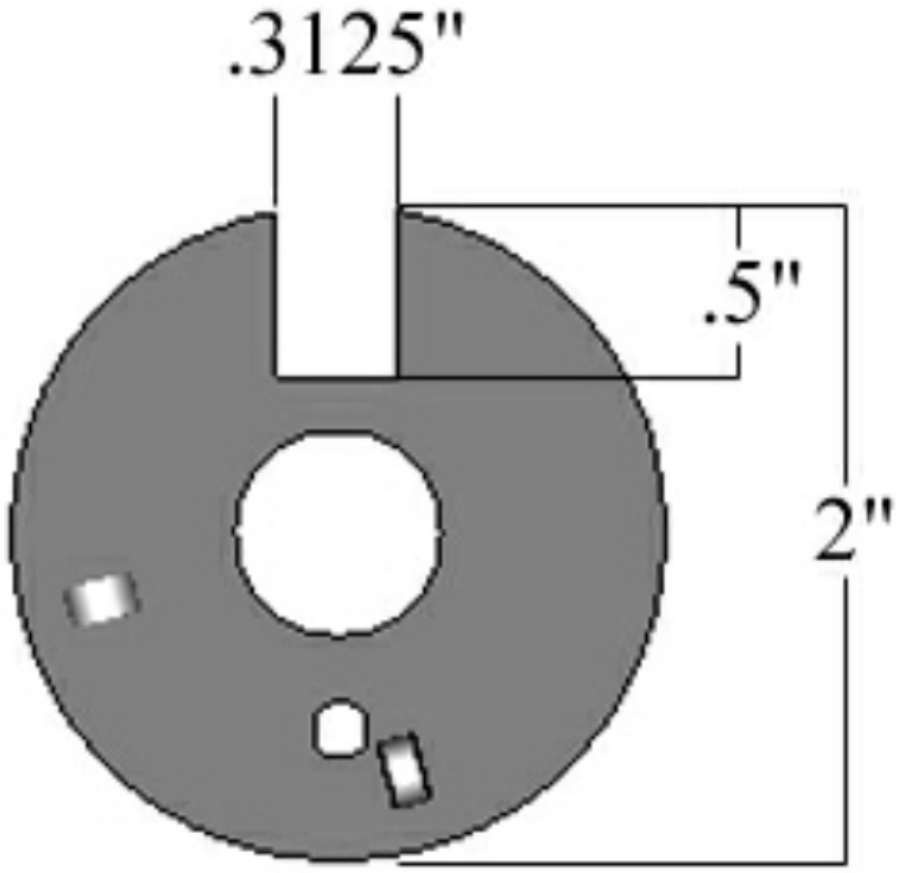
Combination Wheel Specifications

While the wheel pack is the heart of the boltwork, the combination wheels (hereinafter, called wheels) are the heart of the wheel pack. Sentry safes use three wheels, each wheel representing a number in the combination. The third wheel, furthest from the dial, is the third or last number of the combination. The second or middle wheel is the second number of the combination. The first wheel, closest to the dial, is the first number of the combination.

Each wheel is made of 16 gauge steel and is formed using a stamping process. Let's look at what makes up each wheel.

By design, wheel one and two are identical in structure. Each wheel

is approximately 2" in diameter and includes a gate that is approximately .3125" in width and just under .5" deep. The corners of the gate have a slight radius. 180 ø from the gate is a small hole. (Illustration 7.)



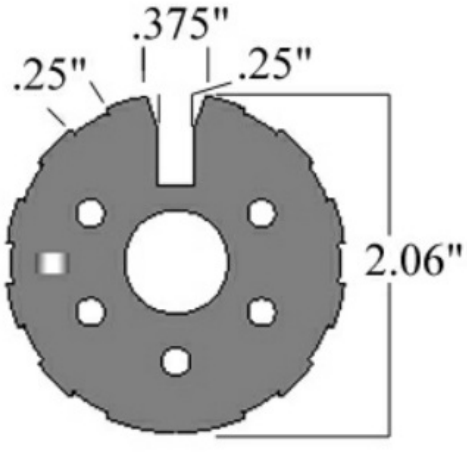
7. Typical dimensions of the first and second wheel. These two
wheels are identical in shape and size.

The purpose of this hole is simple. When first purchased, all Sentry safes are locked in the open position. This is done to prevent the customer from accidentally closing and locking the safe before retrieving the instructions and combination contained on

the paperwork inside the safe. Once the paperwork and combination have been removed, the customer is instructed to remove a sheet metal screw from the boltwork cover found on the inside part of the safe door. This screw passes through these small holes in the wheels and prevents them from turning. Thus, the gates of the wheel pack are held in alignment with the fence, keeping the safe in the open position. Once the screw is removed, the wheels of the wheel pack are free to rotate, allowing the safe to operate normally.

Wheel one and two also have a stamped drive pin facing towards the dial, and a fixed fly, facing away from the dial. The drive pin and fly are approximately .125" in width and spaced at a 90ø angle from one another. Their position from the gate varies.

Wheel three, unlike wheel one and two, has some unique features that are important to the manipulation process. Let's take a closer look at this wheel. (Illustration 8.)



8. The third wheel contains features and measurements that make it very distinct from the other two wheels. These features will be used to help manipulate the lock.

First appearances show that this wheel is much different than the other two. The overall circumference of the wheel is just over 2". There are ten false gates around the perimeter of the wheel, each approximately .25" in width. The diameter of the wheel measured from the base of the false gates is just under 2".

The true gate on this wheel is also different than the other two wheels. While it is still .5" deep, its base measures under .25" in width, expanding to almost .375" by the time it reaches the perimeter of the wheel.

180ø from the gate, on the perimeter of the wheel, is a .75" edge of the wheel where a false gate does not appear.

Also, unlike the other two wheels, the third wheel includes a drive pin but no fly, and five small holes. The hole directly across from the gate is the one used to lock the wheel pack in the open position. The other four holes are where the drive cam connects to and engages the third wheel for rotating. Because the third wheel is driven directly by the rotation of the spindle and drive cam it does not need a fly.

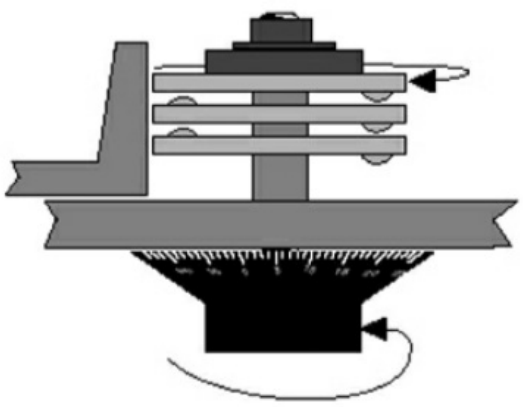
Wheel Action

We are all familiar with combination locks; from the simple padlock to the more complex, high security safe lock. In all of these locks, we are used to the concept of rotating a dial either left/right to the first number, right/left to the second number, and then left/right to the last number. In fact, in most instances, this LEFT-RIGHT-LEFT or RIGHT-LEFT-RIGHT rotation is almost instinctive. Needless to say, the Sentry safe is no different. However, the

unique design of the Sentry wheel does effect the direction of rotation when entering a combination and how a safe is manipulated.

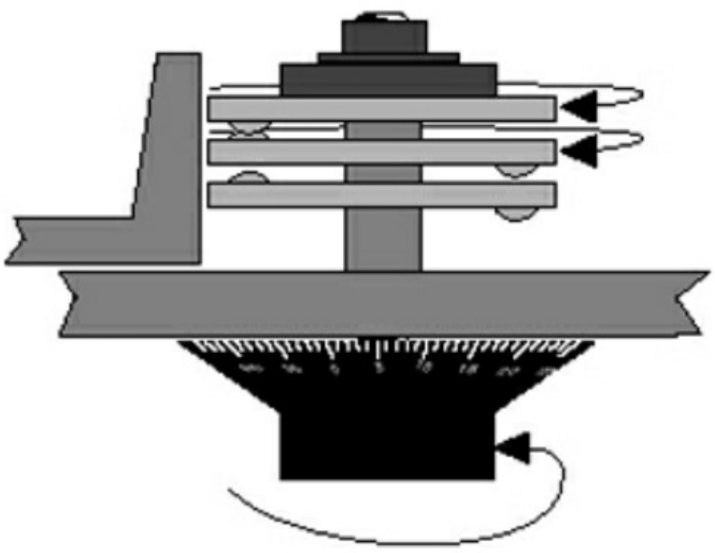
Based on the information we covered on the wheel pack and the wheels of the Sentry safe, we now explore how their specific design effects the rotation sequence of each wheel and the placement of the gates. How the wheels rotate in relation to the position of the gates is called the wheel action of that wheel pack.

To enter a combination, the user rotates the safe's dial either left or right. We know that the dial, spindle, drive cam and third wheel are all directly connected to one another. Therefore, we know that the third wheel is driven directly by the turning of the dial in either direction. (Illustration 9.)



9. The third wheel is driven directly from the turning of the spindle and dial. As soon as the dial is rotated, the wheel starts its rotation.

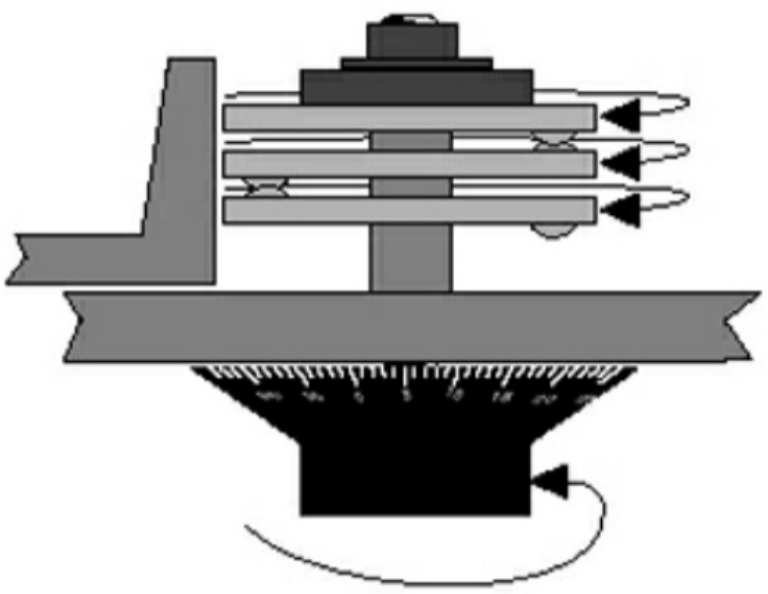
As the third wheel is turned through one complete rotation, it's drive pin comes in contact with or picks up the fly of the second wheel, causing the second wheel to rotate. The third and second wheels are now rotating in the same direction. (Illustration 10.)



10. After one complete revolution of the third wheel, the middle or second wheel is picked up and begins its rotation.

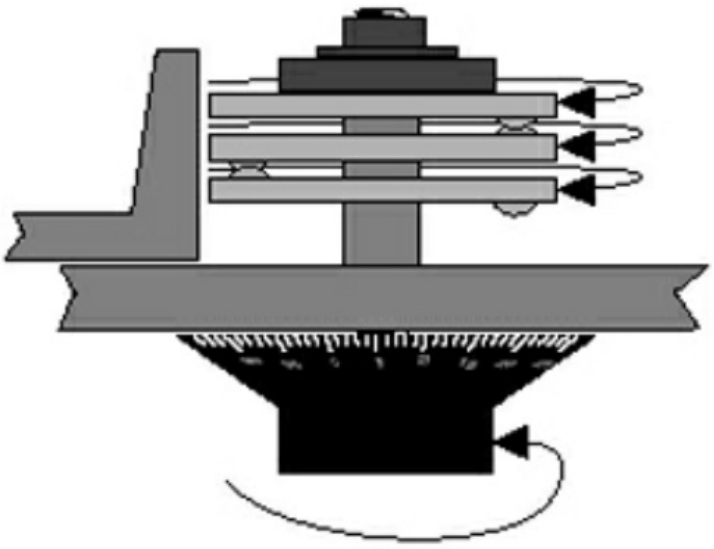
If we continue to turn the dial in the same direction, the drive pin of the

second wheel makes contact or picks up the fly of the first wheel, causing the first wheel to rotate. Now all three wheels are rotating in the same direction. (Illustration 11.)



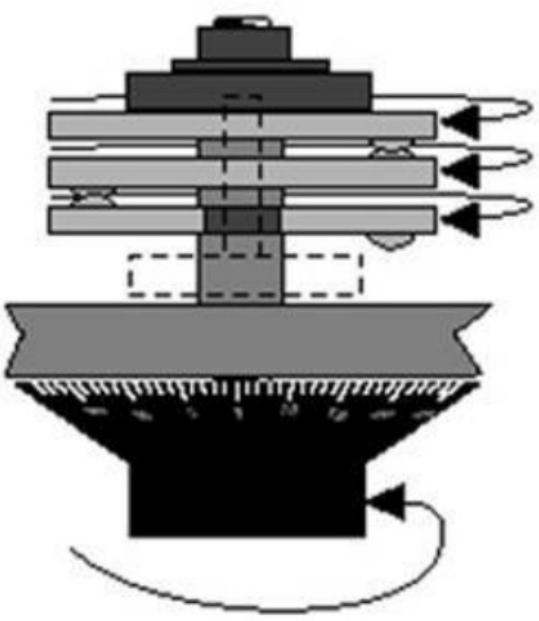
11. After two complete revolutions; the final or first wheel is picked up and begins its rotation.

You will notice that it took at least two complete revolutions to pick up and start to rotate all three wheels. The third wheel begins rotation immediately. At the end of the first rotation, the second wheel is picked up, and it begins to rotate. At the end of the second complete rotation, the first wheel is picked up and begins to rotate. At this point, the first number of the combination can be entered. (Illustration 12.)



12. Once all the wheels have been picked up, the dial can be turned to the first number of the combination.

Continuing rotation, the dial is turned and stopped or parked at the first number of the combination. Because the first wheel represents the first number of the combination, its gate is now aligned with the fence. To align the gates of the second and third wheel, we continue. (Illustration 13.)



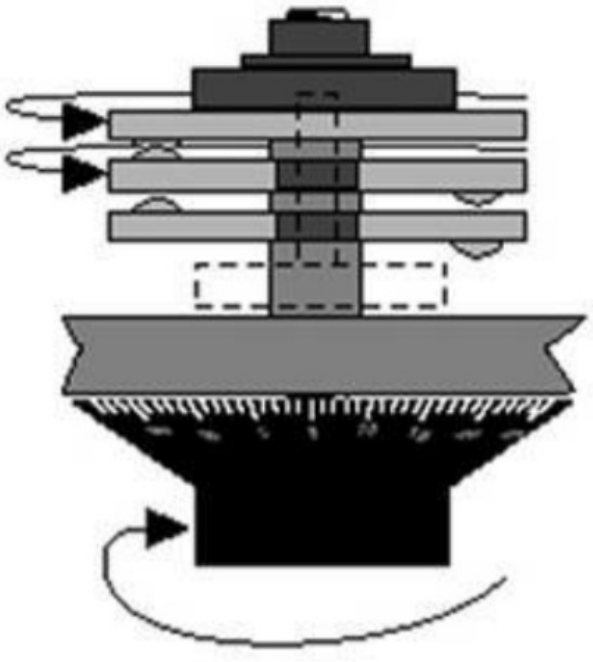
13. Turning to the first number of the combination, aligns the gate of the first wheel in front of the fence.

Now, if we were to continue turning in the same direction, what would happen?

Simply, all three wheels would continue to rotate, including the first wheel! This, of course, is not what we want. With the first wheel parked at the correct position, we only want to rotate the second and third wheel. To do so, we change the direction of our rotation.

Changing direction, we want to make sure we are only picking up and rotate the second and third wheel. Therefore, we begin rotation. The first rotation moves only the third wheel. Completing the first rotation, we now pick up the second wheel. Because we've picked up the second wheel, we now turn the dial to the second number of the combination and park. Because the second wheel represents the second number of the combination, the second wheel is now parked with its gate

aligned at the fence. Because we did not turn the dial beyond the second complete rotation, the first wheel was not picked up and remains parked in the correct position. (Illustration 14.)

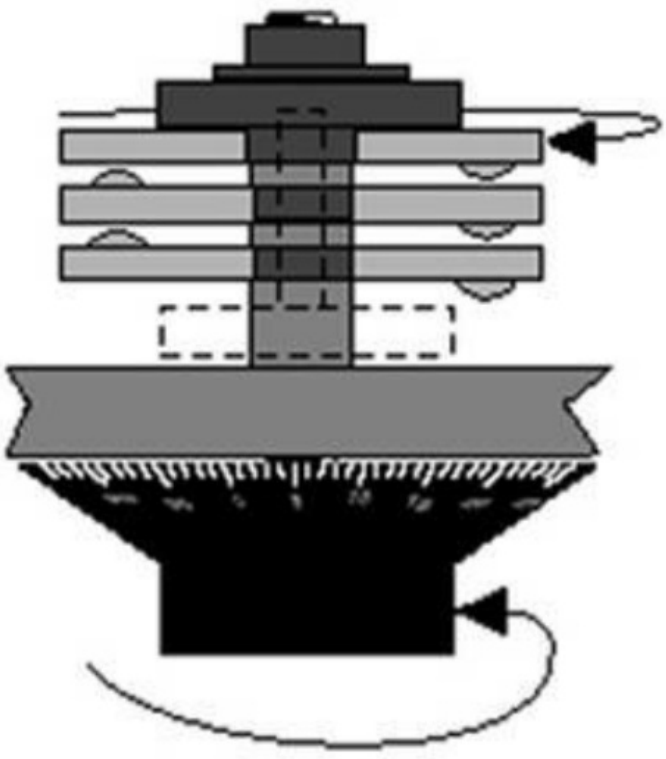


14. With the first gate aligned, rotation is reversed to pick up the second wheel and align its gate in front of the fence.

Now, the third or last number of the combination can be entered. Again, if we were to continue rotating in the same direction, both the third and second wheel would continue to rotate, moving the second wheel out of place. Therefore, we must change directions again.

Changing direction, we turn the dial directly to the last number in the

combination. Remember, if we make more than one complete rotation we pick up the second wheel and move it out of place. Parking the dial on the last number of the combination, the gate of the third wheel now aligns with the fence. (Illustration 15.)



15. With the second gate now properly aligned, the rotation is again reversed, and the last or third wheel gate is aligned in front of the fence. The safe can now be opened.

At this point, the gates of all three wheels align with the fence, allowing the safe to be opened.

We now understand how and why a combination is entered using alternate directions and the correct num-

ber of rotations. In review, we start by turning the dial at least two full to pick up all the wheels of the wheel pack. Continuing the rotation, we park the dial at the first number of the combination. The first wheel is now parked with its gate aligned with the fence.

Reversing the rotation of the dial, we now rotate the dial once past the second number in the combination to pick up the third and second wheel, and then park it on the second number of the combination the next time around. This parks the second wheel with its gate aligned with the fence.

Again, reversing direction, we dial directly to the last number of the combination. This parks the third wheel with its gate in alignment with the fence.

The safe is now open.

To summarize how a Sentry safe is dialed open, then, we can say:

1. Turn the dial three complete turns to the first number of the combination.

2. Reverse direction and rotate the dial once past the second number of the combination, stopping or parking on it the second time around.

3. Reverse direction again. Rotate once to the last number of the combination.

The safe is open.

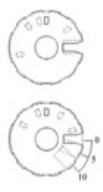
Sentry Wheel Pack Idiosyncrasies

In the previous section, we explained the concept and reasoning behind changing the direction of rotation while entering a combination; the LEFT-RIGHT-LEFT (L-R-L) or RIGHT-LEFT-RIGHT (R-L-R) pattern we use to open a safe. While Sentry safes follow this same pattern, this next portion explains some of idiosyncrasies specific to Sentry safes, that affect the wheel pack's wheel action.

As noted, safe locks use either a moveable fly or a fixed fly. The moveable fly employed by many lock manufacturers allow a safe combination to be dialed in either direction, either L-R-L or R-L-R. This is because the movement of the fly compensates for the thickness of the fly and drive pin when the direction of rotation is changed.

With fixed flys, however, this does not occur. When a combination is entered in one direction, the fly on each wheel does not move to compensate for the thickness of the fly and drive pin when it is entered in the opposite direction. Therefore, a combination entered rotating in one direction does not open the safe when rotated in the opposite direction.

In Sentry safes, factory combinations are dialed L-R-L. Because the drive pins and flys are fixed, entering the factory combination using a R-L-R pattern does not open the safe. (Illustration 16.)



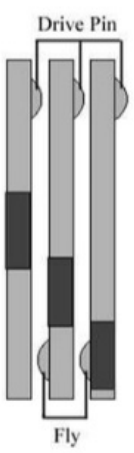
16. With the fixed fly system that Sentry uses, it is imperative that the wheels are turned in the proper direction to align the gates. If turned in the opposite direction, the gate of the first wheel is off by 10 numbers on the dial and the gate of the second wheel is off by 5 numbers on the dial. Because the last wheel is driven directly by the dial, it can be turned in either direction.

The reason for this is quite simple. We previously noted that the drive pin and fly of the Sentry wheel is approximately .125" each in width. When dialing a combination, this width is equal to approximately 2.5 numbers on the dial. The width of both a drive pin and fly, therefore, equals a total difference of approximately 5 numbers on the dial.

When the combination is dialed in the correct direction, the width of the drive pins and flys are taken into consideration, and all the gates align correctly at the fence. When dialing the combination in the reverse direction, however, the combination will be off 5 digits or numbers for each pair of drive pins and flys used by the wheel pack.

In the Sentry safe, the third wheel is directly driven by the drive cam and does not have a fly. Therefore, its number is not affected by the direction of rotation and remains the same no matter what direction the dial is turned. Between the third and second wheel, however, we have one drive pin and one fly. Changing direction for the second number in the combination, therefore, changes the second number by 5 digits or numbers.

In between the second wheel and first wheel, we have another drive pin and fly. Therefore, changing directions for the first number of the combination means that the first number is off by both the drive pin and fly between the third and second wheels, plus the drive pin and fly between the second and first wheel - a difference of 10 digits or numbers! (Illustration 17.)



17. During rotation, the drive pin of the previous wheel contacts and drives the fly of the following wheel. As seen, there is no fly on the third wheel.

It is for this reason that when dialing a number of a known combination or one found during manipulation, that it be dialed in the same direction at all times!

Conclusion: The heart of the Sentry boltwork is the wheel pack. The Sentry wheel pack is made of the dial, spindle, drive cam, and combination wheels.

There are three combination wheels, each one representing a number in the combination. The third wheel represents the third number of the combination and is the furthest from the dial. The second wheel represents the second number of the combination and is the middle wheel. The first wheel represents the first number of the combination and is closest to the dial.

Wheel one and two are identical in structure. Wheel three includes false

gates and holes that are engaged by the drive cam.

The Sentry wheels utilize drive pins and fixed flys. Factory combinations are entered in a L-R-L pattern. The third wheel is driven directly from the dial. The second wheel is picked up after one complete turn of the dial. The first wheel is picked up after two complete rotations of the dial.

The design of the Sentry wheel pack requires the following to enter a combination:

1. Turn the dial three complete turns to the first number of the combination.

2. Reverse direction and rotate the dial once past the second number of the combination, stopping or parking on it the second time around.

3. Reverse direction again. Rotate once to the last number of the combination.

Because the third wheel is driven directly from the dial, direction of rotation does not matter. Due to the drive pins and fixed flys, there is a difference of 5 digits or numbers for each drive pin/fixed fly pair. As a result, a combination in the opposite direction puts the second wheel off by 5 digits and the first wheel off by 10 digits.

It is for this reason that a combination entered in one direction cannot be entered in the reverse direction. And, the direction of rotation when entering a known number or number found during manipulation, must be identical to the direction of rotation when that number was first entered or found!

Having a grasp of the Sentry safe wheel action, we can now look at the principles and concepts that make manipulating a Sentry safe possible.

Chapter Three: Indication

Chapter Goal:

In this chapter, we will explore what indications are and how they are used to determine an opening combination for a locked safe.

In the last chapter we discovered the importance of wheel action. We watched how the correct combination combined with the correct wheel action aligns the gates of the wheel pack in front of the fence, allowing the safe to be opened. This process is very simple to visualize on a safe where the wheels, wheel pack and fence are visible. As a locksmith, however, the secret is to open a safe that is not open and where the locking system cannot be visually observed.

Without the ability to see the wheels move, it becomes necessary to develop techniques and methods that allow us to align the true gates under the fence using what we know about the Sentry wheel pack. These techniques and methods are actually the

tools we use to open lock safes. The most important include:

1. The goal! The goal is to open the safe, not find the combination. The combination that opens the safe is not necessarily the true combination. Each number in a combination can be off by up to 2 numbers in either direction and still allow the safe to open. Therefore, we are not looking for the true combination, just the combination that opens the safe. Once the safe is open, the true combination can be ascertained or a new one entered.

2. Visualization. Visualization is extremely important in determining the position of each gate and each wheel. Because the wheels and wheel pack cannot be seen, it is necessary to visualize the action of the wheels and the position of each gate.

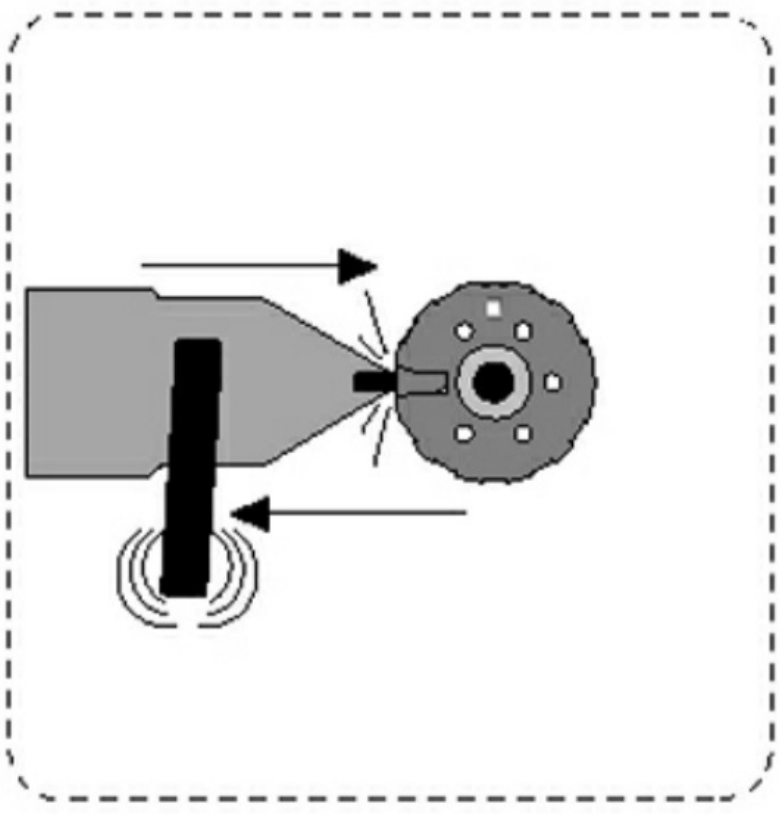
3. Touch. Accompanying visualization is the sense of touch. Feeling the wheel action of a wheel pack is the single biggest factor in being able to visualize the wheel pack, wheels and gate positions.

4. Indications. Indications is the final tool in our safe opening tool box. Like a bounty hunter following an escapee, the locksmith looks for clues that point out the position of each wheel and gate. These clues are called indications. Of course, the better the indications, the easier it is to feel and visualize exactly where the wheels and gates are positioned. Therefore, let's take a look at how indications are produced and how they are read.

What Are Indications?

Because from outside the safe the wheel pack cannot be seen, it is necessary to find a means by which the positions of the wheels and gates can be

determined. In the case of the Sentry safe, the opening handle and fence are used to help determine the position of each wheel and its gate. The handle and fence become, in a sense, an extension of the locksmith inside the safe, allowing the locksmith to feel or see the positions of the wheels. (Illustration 18.)

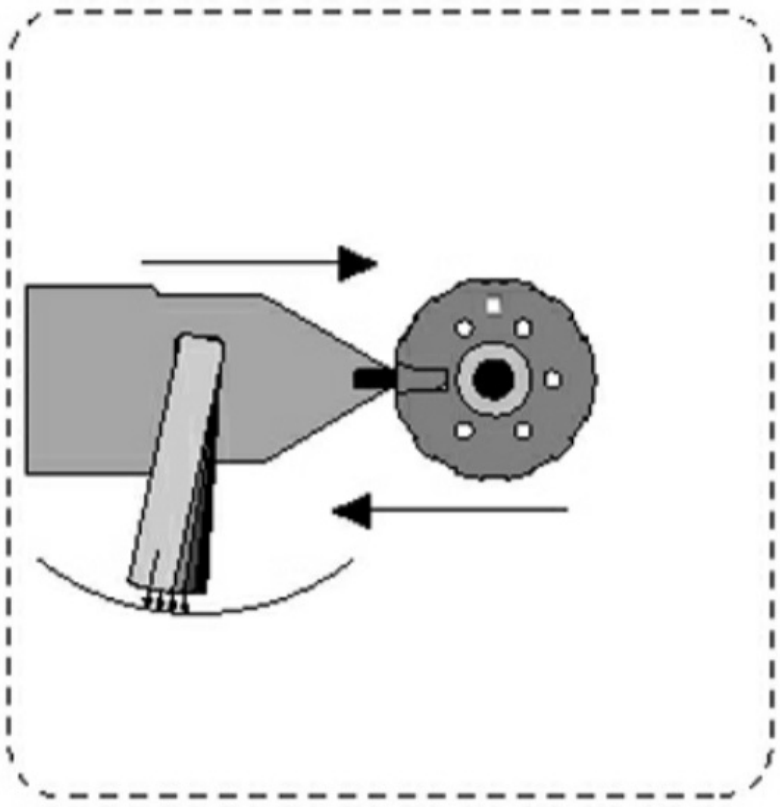


18. Without being able to see through a safe door, the handle and fence become the hands, eyes and ears of the locksmith into the safe.

To do this, the opening handle is turned to place the fence gently up against the wheel pack. The position of the fence is then measured or indexed by the position of the handle, and recorded.

This is repeated over various spots of the wheel pack to produce a simple graph showing the different positions of the fence/handle after each attempt. In this graph certain areas produce a varying range of indexing for the handle position.

In some instances, the handle may rotate a little closer towards the opening position. In other instances, it may move away from the opening position. These variations are the indications. By properly reading these indications, a locksmith is able to determine the position of the gates. (Illustration 19.)



19. Variations in the movement of the handle are used to indicate the progress we are making. These movements are the footprints we want to follow.

How Are Indication Marks Produced?

Indication marks are produced by one of two means: either through the design of the lock, or through imperfections in manufacturing.

In the Sentry safe, it is known that the third wheel contains false gates and that the true gate is roughly 6 to 8 numbers on the dial in width. These are examples where the design of the lock can be used to create an indication.

Also important are the imperfections or aberrations caused in manufacturing. In a perfect system, it would be virtually impossible to manipulate even the simplest of safe locks. Imagine a perfectly straight fence laying on top of three perfectly concentric wheels. As the wheels are turned, the gate from each wheel passes under the fence. However, as the other wheels hold the fence from dropping into any one gate, the gate passes under the fence unde-

tected. In a system where the fence sits evenly across all three wheels and all three wheels are perfectly concentric, the fence does not move, thus, no indications.

In reality, however, the fence, the wheels, the gates are not perfect; and, it's these imperfections or aberrations that make manipulating a safe possible. Changes in dimension on a stamped wheel or a slightly tilted fence allow indications that help the locksmith manipulate a safe. The locksmith's job is to use these imperfections to create indication marks.

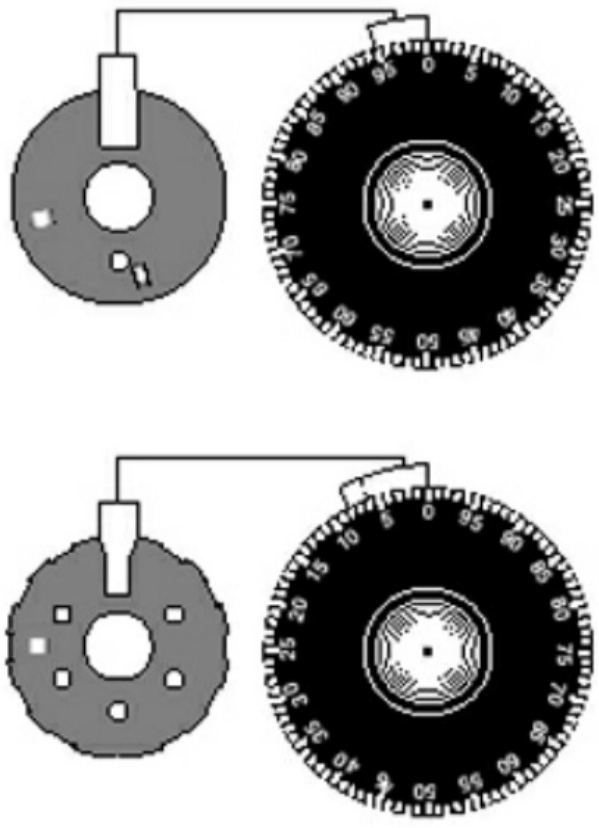
Sentry Design

Mentioned earlier, there are two factors of the Sentry safe lock design that help in finding indication marks - the false gates on the third wheel and the true gates.

True Gate Width

The gates on wheels one and two of the Sentry safe are approximately 5 numbers width on the combination wheel. The width of the third wheel

gate is approximately 6 to 8 numbers width on the combination wheel. (Illustration 20.) This makes it possible to check for a gate every 5 numbers instead of on every number when dialing to open.



20. When looking at the dial, the width of the gate on wheels one and two are 5 numbers in difference. On the third wheel, the difference is roughly 6 to 8 numbers.

For example, when checking for a gate, instead of needing to check 1, then 2, then 3, then 4, then etc. for a gate, it is only necessary to check 0, then 5, then 10, then 15, etc. This cuts down on the amount of necessary di-

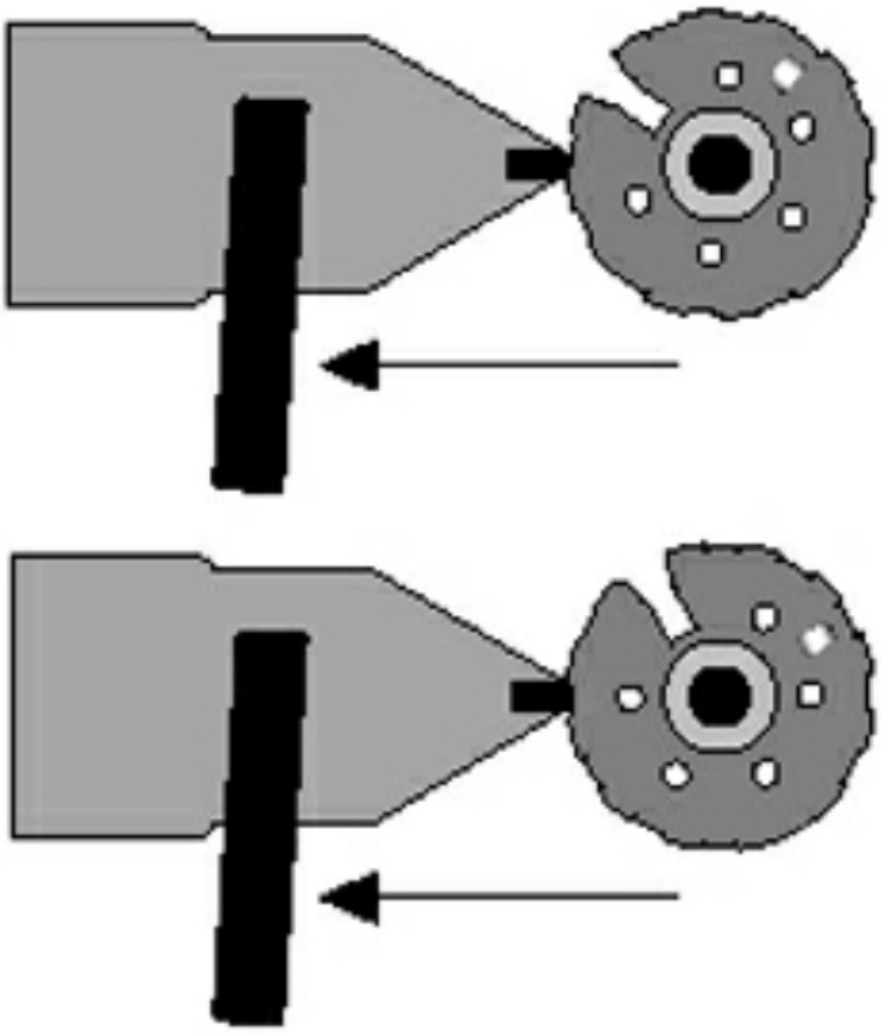
aling when looking for the gate or trying to find the opening combination. It should be noted that in the procedure presented in this manual, the difference is limited to 2.5 numbers. This is done to cover the remote chance that the fence falls perfectly on the outside edges of a gate when dialing.

False Gates

As we know, there are 10 false gates and one true gate on the third wheel. Directly across from the true gate is large area that does not include any false gates. By applying light turning pressure to the handle, we push the fence into the wheel pack. Because the third wheel is slightly larger in diameter than the other two wheels, the fence contacts the third wheel first.

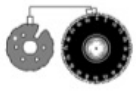
With light contact of the fence against the wheel pack, we can slowly turn the dial. This, of course, immediately causes the third wheel to rotate. As the fence moves along the perimeter of the third wheel it falls into and rises out of the various gates. This is easily

felt on both the handle and the dial as it turns. (Illustration 21.)



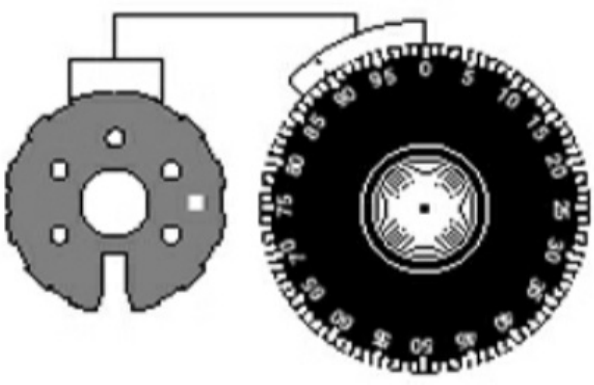
21. The false gates can easily be felt through the handle and dial.

Now, as mentioned in the previous chapter, each of the false gates are approximately .25" wide. When turning the dial, this translates into roughly a span of 2 to 4 digits or numbers. (Illustration 22.)



22. The width of the false gate appears as 2 to 4 numbers difference on the dial.

Once above the false gate, the distance until the next false gate is also roughly 2 to 4 digits or numbers along the dial. This same 2 to 4 digits in a false gate, then 2 to 4 digits out of a false gate continues until the third wheel is rotated to the large area directly across from the true gate. At this point, the distance from false gate to false gate is approximately 10 to 13 digits or numbers on the dial. (Illustration 23.)



23. Directly across from the true gate is a large area where the distance from false gate to the next false gate is 10 to 13 numbers on the dial.

Continuing to rotate the third wheel, we know that the true gate has

an opening of approximately .3125", just a bit larger than the false gates. On the dial, this translates in 6 to 8 digits before the fence rides back up on the perimeter of the wheel.

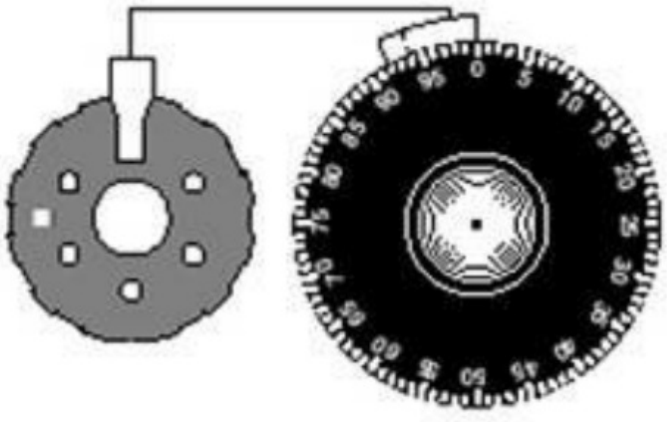
Using this information, we can now determine the third or last number of the combination. For the sake of consistency, we always rotate the dial three times in either direction to pick up all three wheels, and park them at "0."

Applying light pressure to the handle, we move the fence into the wheel pack and begin to rotate the dial. As the fence moves along the perimeter of the wheel it falls into and rises out of the false gates and true gate. At this point there are two ways to determine where the true gate and our number is seated.

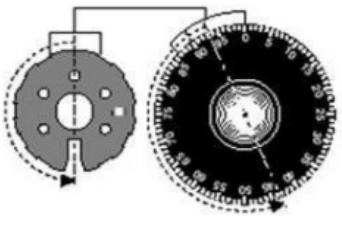
1. When the fence falls into a gate, rotate the dial back and forth. If it only moves 2 to 4 numbers, it is a false gate. Continue to turn the dial, allowing

the fence to rise up out of the gate that was just tested until the next one appears. Continue this process, checking the space of each gate by dialing back and forth. When the dial is able to move 6 to 8 numbers on the dial, this is the true gate. (Illustration 24.)

2. Follow the procedure in step 1 above. But instead of searching for the distance in each suspected gate, search to find the large area between gates. If the fence rises out of a suspected gate and does not fall into the next one for 10 to 13 numbers, we know that the fence is located on the large area directly across from the true gate. (Illustration 25.)



24. When the dial is able to move 6 to 8 numbers, the true gate of the third wheel has been found.



25. The true gate is also directly across from the 10 to 13 number area found on the third wheel. Once the center of this area is known, add or subtract 50 to find the center of the true gate.

To find the true gate, find the center of this large area by turning the dial in each direction until the fence falls into a false gate on either side of the area. Mark down the number where the false gates start. The center point of the large area is the number that is directly between the two false gate indication marks. As the true gate is directly across from this number, we must either add or subtract 50 numbers to determine the number of the true gate.

For example. We find that as we turn the dial, the fence begins to rise out of a suspected gate at the number 25 and falls into the next one at 38. We now know that the large area is between the numbers 25 and 38. The center point between 25 and 38 is about 31.5. Because the true gate is halfway around the dial from this point, we add 50 to the 31.5. This gives us a true gate location for the third wheel, or a third number for the combination of 81.5.

Aberrations In Manufacturing

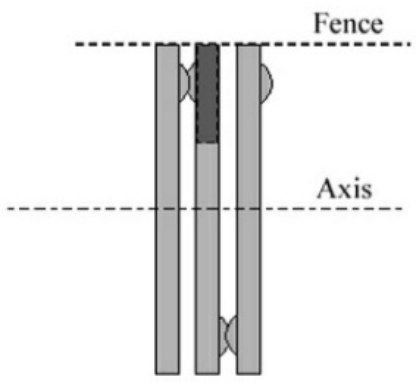
Just as a lock's design helps in manipulating a safe, so do the imperfections and aberrations inherent in manufacturing. The two most important for the locksmith are wheel concentricity and fence tipping or warping.

Concentricity And Wheel Size

In manufacturing a safe's wheel pack, all the wheels are placed on the same post. Ideally, all the wheels are exactly the same size, shape and have identical centers. In doing so, by looking straight into the face of the wheel

pack, only the front wheel is visible. Because all wheels are identical in size, the other wheels are hidden directly behind the front wheel and are not seen. Even if the back wheels were rotated, because they are identical in size and have an identical center, they are still not visible from the front.

Looking from the side, let's draw a line across the top of the three identically sized wheels. Now, if a single wheel is turned such that its gate falls beneath the line, what happens to the line? Nothing. The other two wheels support the line and prevent it from falling into the gate. (Illustration 26.) Also, because all of the wheels are identical in size and axis, the line does not move up or down. This is because these wheels are perfectly concentric - they are identical in diameter and share an identical axis.



26. In the perfect system, all wheels would be perfectly concentric on the axis. If this were possible, a fence laying below a wheel pack would never be able to detect the presence of a gate.

In reality, however, even the most accurate manufacturing process cannot produce absolutely identical wheels. The result is that portions of each wheel are not quite center to the axis, causing high and low spots on each wheel as they rotate.

Looking from the side, again, let's look at what happens when the wheels are not quite identical in size or have an identical axis point. In this example, a line is placed over the three wheels, but each wheel is a different size. Now, as the wheels are rotated, what happens? As the gate of the larger wheel aligns below the line, the line falls into the gate. If we were watching the dial, we notice at what number the line fell into the gate and record that number. (Illustration 27.)

27. If the wheels are not identical in size or lie on the same axis, the fence will ride on the highest wheel on the wheel pack. As the wheels are rotated, the fence continues to ride on the highest point of the wheel pack, falling into gates as they passed under it. This type of movement in the fence is reflected in the movement of the handle as indications.

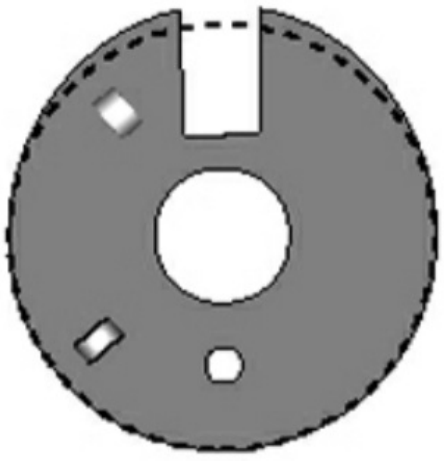
If we continued to rotate the other two wheels, what happens? Soon the gate from the next largest wheel aligns below the fence and once again the fence falls. The number for this wheel is recorded.

While exaggerated, this is exactly the principle we are going to use in finding a number in the combination to the safe.

Sentry wheels are simple, stamped steel wheels. While to the human eye each wheel is identical, simple measuring tools tell us that they are not nearly identical. In the process of stamping, the wheels become slightly elongated at one point or another, and are slightly off center on the axis. The result is, as the wheels are rotated, the

line or fence, actually moves up and down, depending on the high and low spots of the wheel pack.

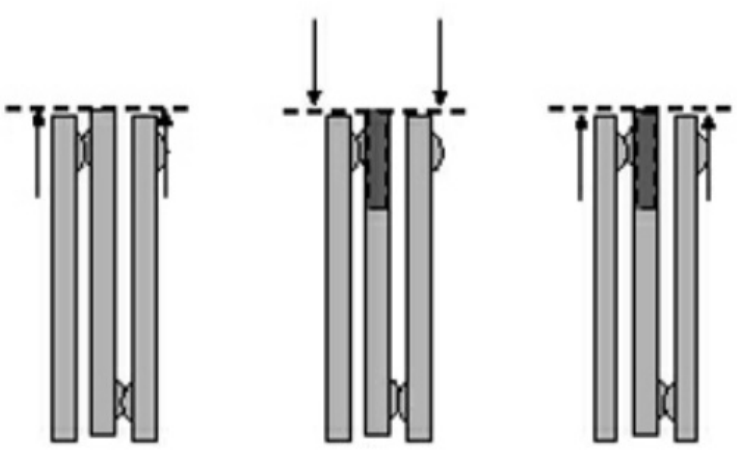
These high and low spots are used to help us determine exactly where a gate is present. For example, generally, due to the stamping process, the outside edges or corners of a gate are slightly higher than the normal wheel. (Illustration 28.)



28. In real life, the wheels are not perfectly round.

The wheels of a normal wheel pack may look identical. Drawing a line over the three wheels, we start rotating the wheels. As the gate of the center wheel approaches the line, the line is raised slightly above the rest of the

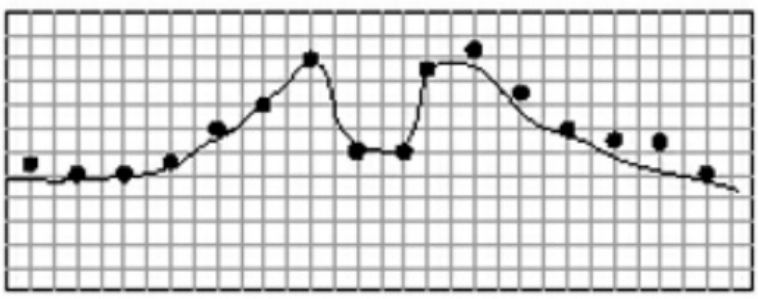
wheel pack. Then, as the gate aligns below the line, the line suddenly drops down into the gate area and rests on the other two wheels. If the wheel continues to rotate, it again makes an abrupt rise on the other side of the gate. (Illustration 29.)



29. In reality, the fence rises and falls due to the inconsistencies of manufacturing the wheels. This makes it possible to detect the position of the true gates.

Recording the movement of the line through the rotation of the wheel, we see a slow, steady rise of the line as it approaches the edge of the gate. Then, as the gate aligns below the line, the line makes an abrupt fall and stays there until the next edge of the gate. When the next edge of the gate falls below the line, the line rises abruptly,

indicating that the gate is no longer below it. (Illustration 30.)



30. If the position of the handle is graphed for each time the fence touches the wheel, the graph will appear as the one above. Notice the slow rise, the abrupt fall, the abrupt rise and then the gradual fall. The area between the abrupt fall and abrupt rise indicate the position of a true gate.

Obviously, in our safe, the line is actually the fence, and the movement of the line in-and-out of the gate is movement of the fence over the wheel pack. This fence movement is recorded by the movement in the opening handle and are the indication marks we are seeking when trying to open the safe.

Fence Tipping/Warping

Another factor that makes manipulating a safe possible is the condition of the fence. As stated earlier, if all things were perfect, it would be nearly impossible to manipulate a safe. While

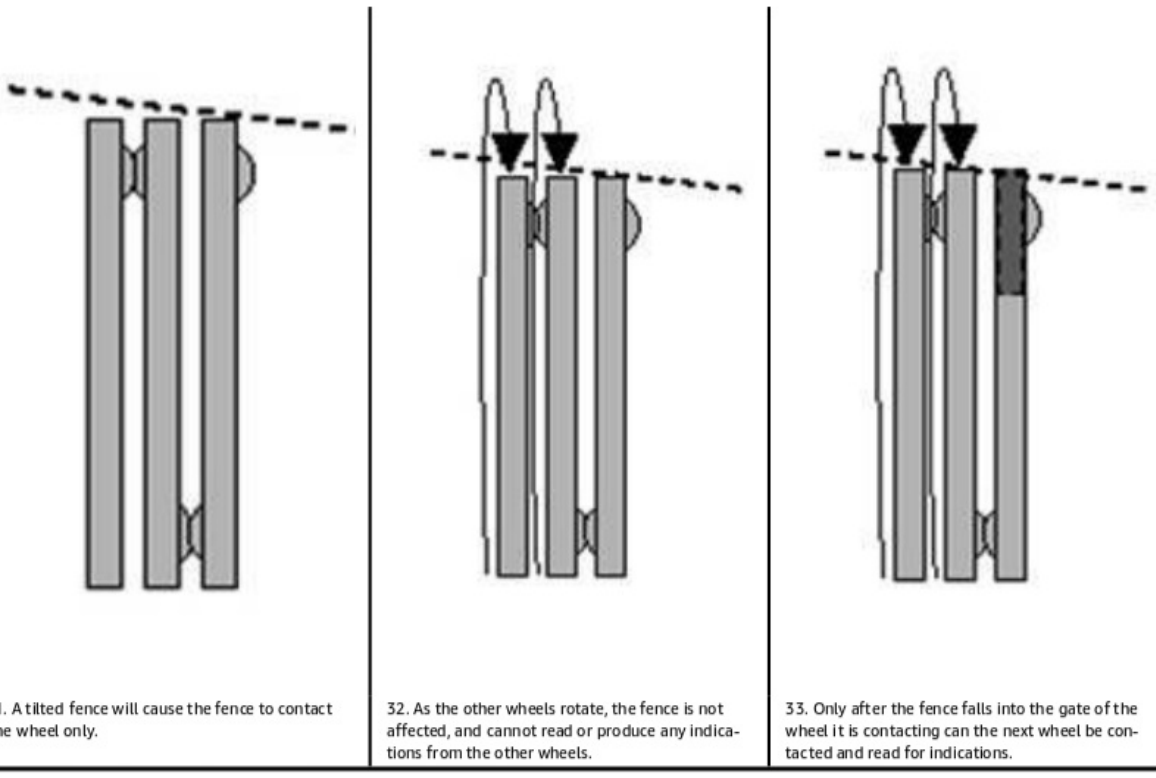
we know that the wheels are not exactly concentric and perfect, neither is the fence.

In our last illustrations, we show what happens as a gate passes under a perfectly flat line. However, even the best manufactured fence is not perfect. In some instances the fence may be tipped or tilted. This, of course, means that the fence comes into contact with one wheel before it contacts any of the others. How does this affect finding an indication? Simple.

In the illustration 31, the line is tipped down, its right side slightly closer to the wheel on the right than to any others. Resting the line on the wheel on the right, lets rotate the first two wheels. What happens? Nothing. Because the fence is tilted, it cannot come into contact with the other wheels in the wheel pack. (Illustration 32.)

Now, what happens when we rotate the wheel furthest right? Because this is the only wheel that comes into

contact with the line, all indications are made from this wheel only. The wheel is rotated until its gate aligns under the line and the line drops into the gate. It's only at this time that the line contacts the other wheels. (Illustration 33.)



31. A tilted fence will cause the fence to contact one wheel only.

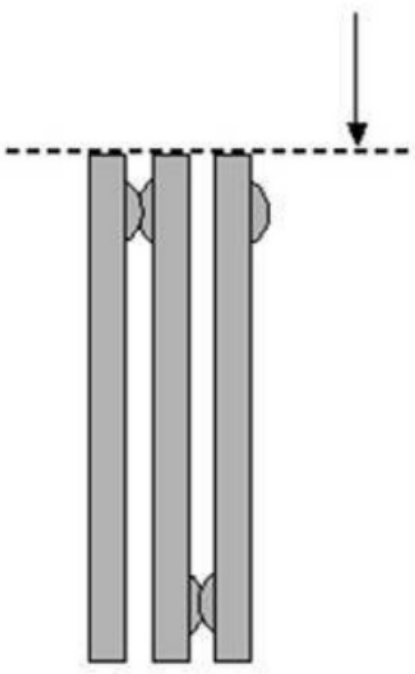
32. As the other wheels rotate, the fence is not affected, and cannot read or produce any indications from the other wheels.

33. Only after the fence falls into the gate of the wheel it is contacting can the next wheel be contacted and read for indications.

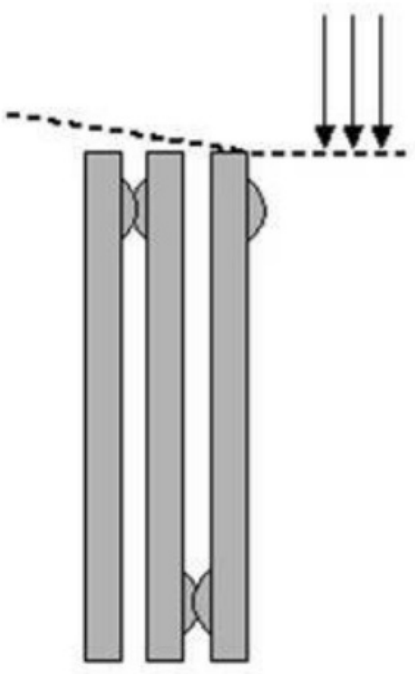
Obviously, if the fence is tilted, it is easy to get indications from whatever wheel it is resting on. And, while we illustrated the line tipping down, what happens if we tilt the line up? That's right, it comes into contact with the wheel furthest left first.

Another fence aberration is fence warping. Fence warping occurs as the result of pressure being placed on the fence against the wheels of the wheel

pack. In Illustration 34, the fence is placed against the wheel pack using very light pressure. Under these conditions the fence lies across the top of all three wheels. Applying a little pressure, however, the fence bends or warps slightly from the wheel with the highest point in the pack. The more pressure that is applied, the greater the fence warp. (Illustration 35.)



34. When the proper pressure is applied to the fence, it lies evenly across the top of all three wheels.



35. If too much pressure is applied to the fence, it warps, and does not allow for consistent and proper indications from the wheels.

The problem with fence warping is that it can distort the indications we are trying to find. If, when coming into contact with the wheel pack, excessive pressure is applied, the fence is forced to move further than it would under a lighter pressure. Thus, we end up with an incorrect indication on the movement of the fence. As such, it is critical that the lightest amount of pressure necessary be used to place the fence against the wheel pack.

Finally, one of the cardinal rules in manipulation is consistency, especially as it applies to how much pressure is applied to the fence. When putting the fence on the wheel pack to obtain an indication, it is important that the same amount of pressure be applied on each attempt. This assures that the indications are consistent from one attempt to the next. For example, if light pressure is applied at a low spot on the wheel, it is indicated by the position of the fence and the handle. If a high spot comes along and the same pressure is applied, the indication mark from the handle moves

respectively. If, however, more pressure is applied while on the high spot, the fence may warp and show the same indication that appeared for the low spot on the wheel. Nine times out of ten, success is dependent on applying consistent pressure.

Conclusion:

In a Sentry safe, the fence and handle are an extension of the locksmith into the safe.

Indication marks are created and read by indexing the position of the handle when the fence is placed against the wheel pack.

Indication marks are created by both the design of a safe lock as well as the imperfections and aberrations of manufacturing the lock.

In the Sentry safe, the false gates of the third wheel are a design feature that allow us to easily find the third or last number of the combination.

In the Sentry safe, the width of the true gates allow us to look for

indication marks every 5 numbers, although every 2.5 numbers is more cautious.

It is the imperfections in a safe lock that allow it to be manipulated.

Despite being perfect to the naked eye, the wheels of a wheel pack have both high and low spots.

In looking for indications, it is imperative that the lightest amount of pressure be applied to the fence, and that the same amount of pressure be applied on all attempts.

Chapter Four: Reading & Amplifying Indication Marks

Chapter Goals:

In the last chapter we saw how and why indication marks are created. Also, briefly covered was how the movement of the fence is reflected in the position of the opening handle. In this chapter, we will learn how to measure or index the position of the handle and how to magnify or amplify those readings.

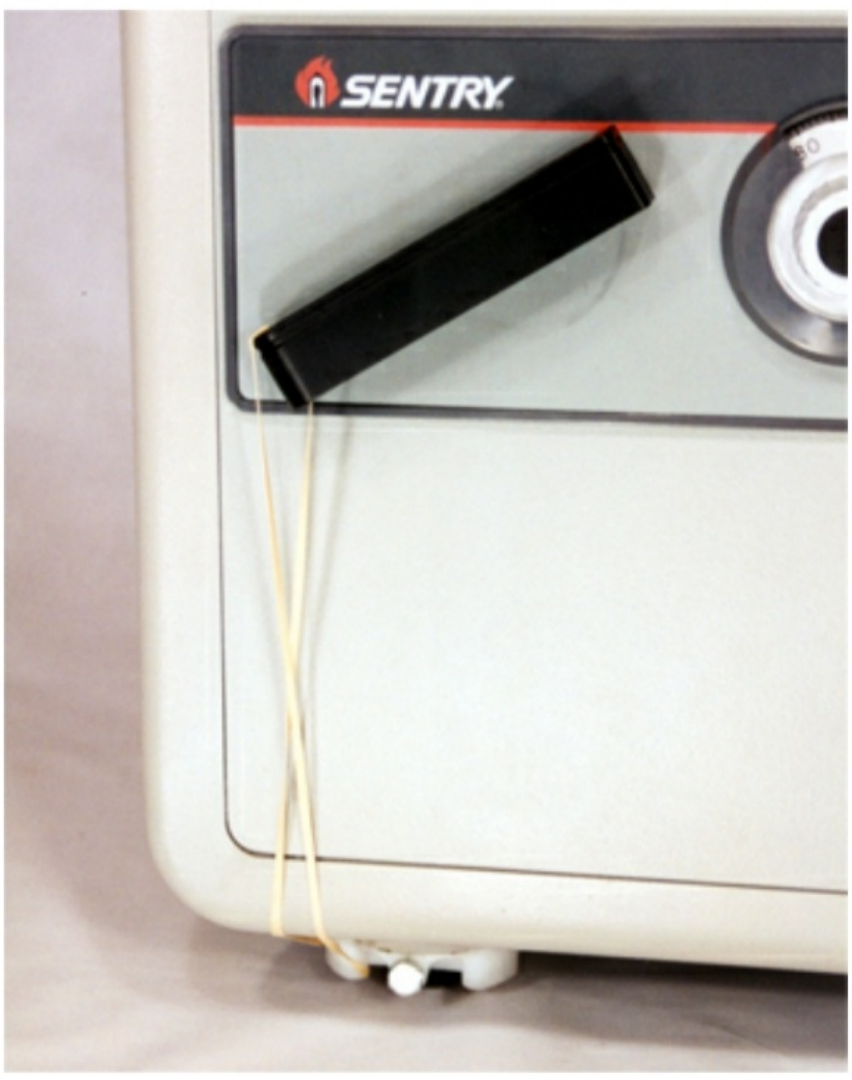
Handle/Fence Pressure

Mentioned in the last chapter, the pressure applied to the fence is extremely critical in creating indication marks. Pressures too hard or inconsistent severely hampers the ability to produce the indications needed to manipulate a safe. Therefore, to enhance the chances of creating indication marks on a consistent basis, it is necessary to follow these two rules:

1. Use the lightest pressure necessary to touch the fence to the wheel pack.

2. Always use the same amount of pressure when pushing the fence into the wheel pack.

In Sentry safe manipulation, consistent pressure can be applied using a simple rubber band. By attaching one end of a rubber band around the handle and the other around a wheel or foot on the bottom of the safe, a proper and consistent amount of pressure can be applied to the fence. (Photograph 36.)



36. To provide proper and consistent pressure on the wheels, the Saber Sentry Manipulation Aid employs the use of a large rubber band.

Reading

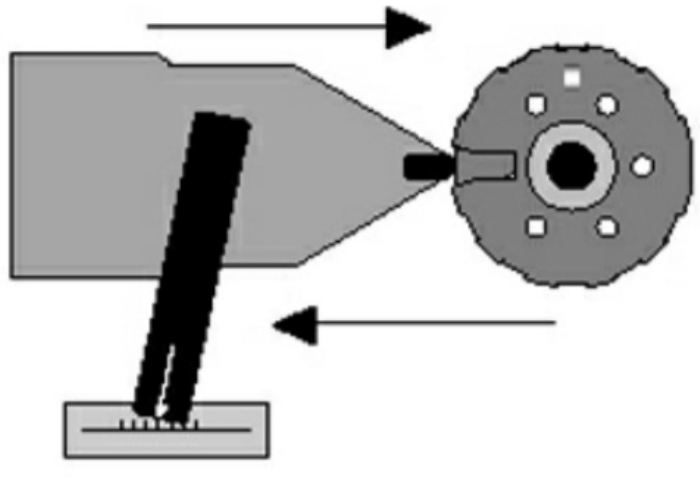
In reading the safe lock, we are actually looking for variations in the position of the fence as it is placed on different, yet known, portions of the wheel pack. Because the fence cannot be seen from outside the safe, we use the position of the handle that drives the fence as an indicator of the fence's position.

To observe the fence position, then, it is necessary to find some way of indexing the position of the handle. To do this, a simple graduated index line is made on a piece of tape. After parking the wheels at a desired position, the handle is turned to lightly touch the fence on the wheel pack.

Drawing a small line on the outside edge of the handle, the center line of the graduated index marker is placed below the mark made on the handle.

All further attempts are now read relative to where this first index mark was positioned on the gradu-

ated index marker. (Illustration 37.) Provided consistency in pressure is adhered to, the handle will display indication marks slightly to the left and slightly to the right of the initial index mark.



37. In order to read indications, a line is placed on the handle and read against and index line.

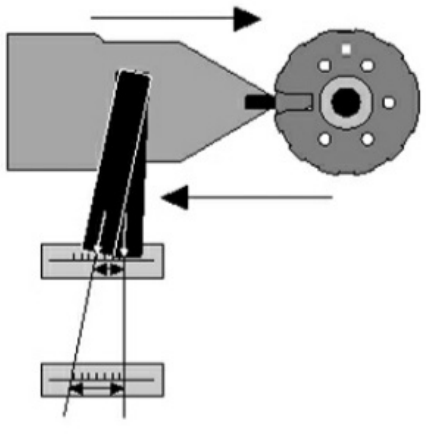
Amplifying

Now, this may sound simple enough until we realize that the differences in position that are being looked for are only a few thousandths of an inch. This, in most cases, is much smaller than the human eye can detect. Therefore, in order to make the differences in the handle position more apparent, it is necessary to create a means

by which to amplify the indications we are getting from the handle.

The technique used to amplify the indications is really quite simple. Using simple geometry, it is known that the distance traveled by the radius of the handle can be increased by simply increasing the radius of the handle. Or, in other words, if the handle is made longer, the indications made by the handle will also be greater.

Obviously, to physically extend the existing handle is not possible. Therefore, it is necessary to use a tool that emulates an extended handle. For this reason, Saber Tool Company created the Sentry Safe Manipulation Aid. By attaching the tool to the handle of a Sentry safe, the indications can be amplified enough for easy reading. (Illustration 38.)



38. The Saber Sentry Manipulation Aid extends the length of the handle and amplifies the indications for easy reading.

Conclusion:

The two rules in applying pressure to obtain indication marks include:

1. Use the lightest pressure necessary to touch the fence to the wheel pack.
2. Always use the same amount of pressure when pushing the fence into the wheel pack.

Proper and consistent pressure can be obtained using a simple rubber band.

In order to make indications easier to read, the Saber Tool Sentry Safe Manipulation Aid can be used to amplify the indications.

Chapter Five: Manipulating The Sentry Safe

Through the previous chapters, we have built a foundation that now allows us to manipulate the Sentry safe. In this chapter, we go through the process of manipulating a safe using the Saber Sentry Manipulation Aid. The first section that follows, shows how to attach the Saber Tool Sentry Safe Manipulation Aid, while the next section shows a three step process used to manipulate the safe.

Diagnostics

Before beginning any manipulation, it is necessary to determine the cause for the safe not opening. Even when it looks as simple as a customer simply forgetting a combination, simple diagnostics should be performed on the safe before manipulation is even attempted.

Remember that there are only a few components in the Sentry safe boltwork that can go bad. Still, if any part of the boltwork is bad, the safe probably

cannot be opened by simple manipulation.

When first approaching the Sentry safe, check that the opening handle moves easily and is attempting to pull the bolt open. Feel the dial as the lever is being moved to see if the fence is hitting on the wheel pack.

If the handle rotates freely, the cam may have become loose or dislodged and is not properly engaging the bolt. If the handle does not move at all, there may be corrosion or another problem preventing the handle from moving.

After checking the handle movement, check dial and wheel action. The dial should turn with only little resistance. While turning the dial, you should feel all three wheels being picked up.

If there are problems with picking up wheels, turning the dial, or the handle, it is probably best to drill the safe open. If the boltwork seems to be

functional, then proceed to manipulate the safe.

The Saber Tool Sentry Safe Manipulation Aid

The Sentry Manipulation Aid by Saber Tool Company is attached to the opening handle of the Sentry safe and is used to amplify the indications found during the manipulation process.

NOTE!

Although the Saber Tool Sentry Manipulation Aid is a valuable tool to own, it is not absolutely necessary to have in order to manipulate the Sentry safe.

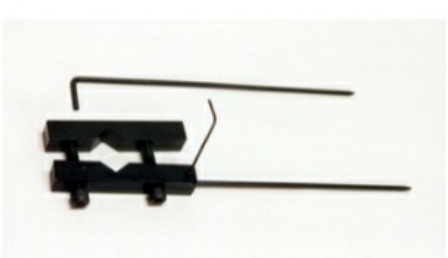
Make your own tool by fashioning a wire as a pointer- a piece of a coat hanger will do - and firmly fasten it to the handle. Draw several graduated lines on a piece of masking tape and use that in place of the magnetic graduated index card.

Contents: One clamp, a straight pointer and a 90ø pointer, two Allen

wrenches, a large rubber band and a magnetic graduated index card. (Photograph 39.)

39. All the components of the Saber Sentry Manipulation Aid.

Installation: Attach the appropriate pointer into the end of the clamp and tighten using the enclosed Allen wrench. In most cases, the straight pointer can be used. Where the handle position and direction does not allow the straight pointer to be used, attach the 90ø pointer. (Photograph 40.)



40. Attach the proper pointer to the clamping tool.

With the pointer attached to the clamp, attach the clamp to the safe handle. On most Sentry safes, the tool can be attached to the opening handle's spindle. (Photograph 41.) In a few late model safes the tool must be attached to the thin plastic rib found on the backside of the opening handle. (Photograph 42.)

41. In most instances, the tool can be clamped to the handles spindle.

42. In later model safes, it may be necessary to attach the tool to the rib located behind the handle.

For handle mounting, remove the two large cap screws that hold the clamp together. Place both halves around the spindle, noting in which direction the pointer is directed.

Replace the cap screws and snugly tighten the clamp making sure that there is enough room between the clamp and the safe door to prevent binding and allow the handle to rotate. Do not over tighten.

For rib mounting, tighten the cap screws to allow approximately 3/16" gap in the clamp. Slide the clamp over the rib and tighten the cap screws. Do not over tighten.

You are now ready to manipulate the safe.

Manipulating the Sentry Safe

The manipulation process of the Sentry safe is very simple and is completed in three easy steps.

- Using the false gates of the third wheel, the last or third number of the combination is obtained.

- Using the manipulation aid, a second number is obtained.

- Using abbreviated dialing and the process of elimination, the last and final number is obtained, and the safe opened.

1. Finding the third number of the combination. Do not attach the Sentry Manipulation Aid at this time.

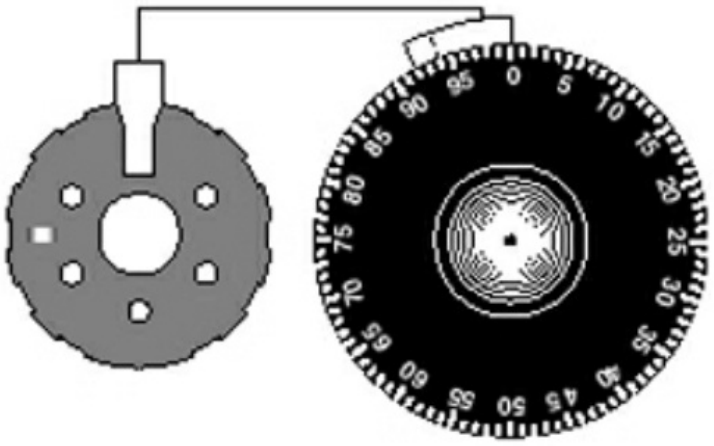
By design, the last or third wheel of the Sentry wheel pack includes false gates. The design and nature of these false gates will be used to determine the last or third number in the combination. Two methods are discussed.

Alternate Method 1

Dial right three times to pick up all the wheels and park at 0. Dial left 5 numbers. Applying light pressure on the handle, rotate the dial back and forth, noting the number of digits it rotates.

If the dial rotates between 3 and 5 numbers, it is a false gate. Take enough pressure off the handle to rotate 5 numbers to the next gate. Repeat the rotating motion, again noting the number of digits the dial rotates.

Repeat this process around the entire wheel until the dial rotates a full 6 to 8 digits. (Illustration 43.) This is the true gate of the third wheel. Mark down the digit at the center of this rotation area. This is the last or third number of the combination.



43. Look for the position where the dial moves 6 to 8 numbers. This is the position of the true gate.

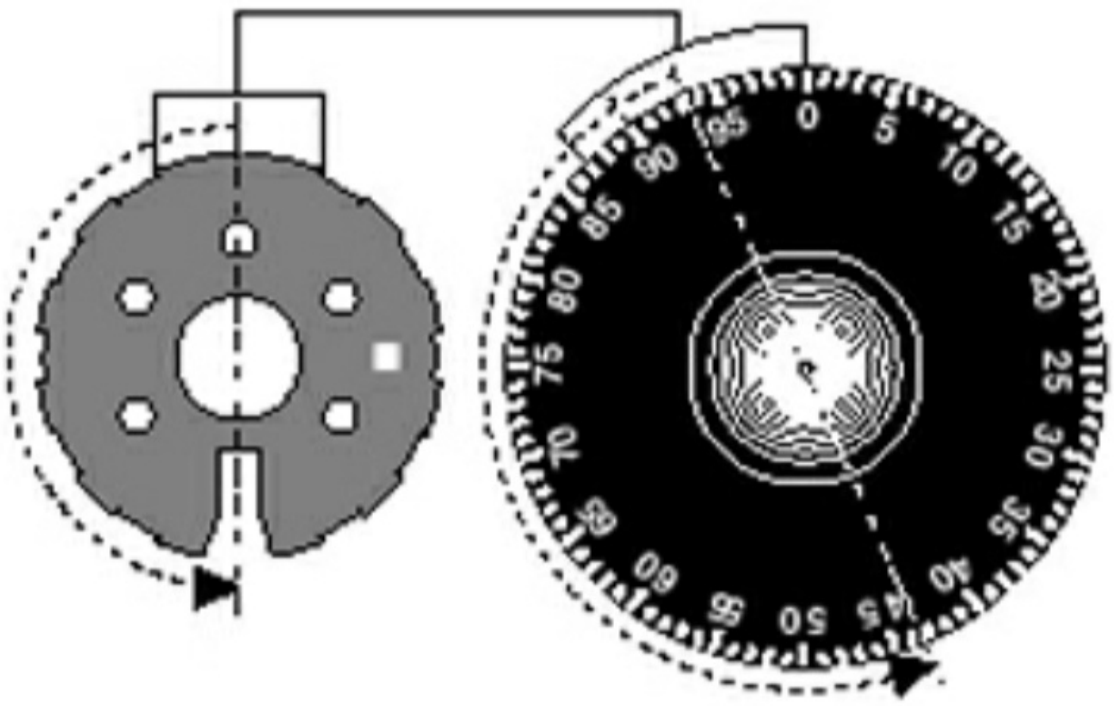
Alternate Method 2

Dial right three times to pick up all the wheels and park at 0. Apply light pressure to the opening handle and rotate the dial left until the fence falls into a gate.

Continue rotating until the fence begins to rise out of the gate, note this point on the dial. Proceed rotating the

dial, noting how many digits pass before the fence falls into the next gate.

Continue this process around the entire wheel. When the dial rotates 10 to 13 digits before falling into the next gate, this is the large area directly across from the true gate. Find the center point of this area and add or subtract 50 to determine the position of the true gate. (Illustration 44.)



44. Locate the large area between false gates and add or subtract
50 numbers to find the true gate.

One number of the opening combination is now known. This is the last

or third number of the combination. We will call this the Drop In point.

2. With a single number, or the Drop In, of the combination known, we can now pursue a second number. In finding this next number we will be using the Saber Sentry Manipulation Aid and our knowledge of wheel action to create indications.

In creating the indications, we are observing the position of the pointer in relation to the center index line on the magnetic index marker. What we are searching for is the most amount of movement by the pointer/ handle towards the opening position. The point at which we receive the most movement, is our number.

In pursuing this next number , however, two things should be noted. First, even when we find the next number, it is unknown whether it comes from wheel one or wheel two. Second, the direction of dial rotation is extremely important. When the number is found and used, it can only be used

by dialing in the same direction it was found.

Attach the Sentry Safe Manipulation Aid as described above. Place the rubber band that came with the Sentry Manipulation Aid over the end of the opening handle. In some instances, like the rib mounting, it may be necessary to place it over the end of the clamp. Attach the other end of the rubber band to a wheel or foot on the bottom of the safe. This creates constant and consistent pressure on the fence and wheel pack, allowing for a more accurate indication. (Photograph 45.)

45. Attach the rubber band to a wheel and the handle.

Lift the handle to relieve pressure on the wheel pack. Dial three times right to pick up all the wheels and park five numbers below Drop In, or the third number of the combination. For example, if Drop In is 63, we rotate the dial three times right and park at 58. (Photograph 46.)

46. Dial three times right to pick up all wheels and park 5 numbers less than the drop in.

Now dial left to Drop In and release the handle. Place the magnetic index marker with its center index line aligned with the end of the pointer. (Photograph 47.)

47. Dial left, directly to drop in and release the handle. Align the magnetic index marker and the pointer.

Lift the handle and dial right 2.5 numbers lower than the number that was parked on - in our example, dial right to 55.5 - then dial left back to Drop In. (Photograph 48.)

48. Lift the handle and dial 2.5 numbers lower than the number first parked on. Then dial left, back to drop in.

Release the handle and check the index marker. Note any movement of the pointer. (Photograph 49.) Continue this process, subtracting 2.5 numbers when dialing right on each attempt.

49. Release the handle and check for indications.

When all the possible numbers on the dial have been tried, take the number that displayed the most indication. We will use this as our second known number. With two numbers known, it is only a process of elimination to open the safe.

The rubber band and Sentry Manipulation Aid can be removed from the safe.

3. We now know two of the three necessary numbers for opening the safe. The first number we found is the Drop In or last number of the combination. The next number we found, however, could be the first or second number of the combination.

Let's say, for example, we know our two numbers to be 63 and 32, where 63 is the third number of the combination, then our combination may be either 32 -?-63 or ?-32-63.

Of course, the only way to find out is through the process of elimina-

tion. In doing so, however, we want to take the least amount of time possible. Therefore, we will use a process called abbreviated dialing.

Abbreviated Dialing

In abbreviated dialing, wheel action allows us to park the first wheel of the wheel pack at a desired number and leave it there while only the second wheel is moved. The advantage to this process is that once the first wheel is positioned at our first number, only two numbers have to be dialed, cutting down on the amount of total dialing necessary to cover all the numbers in a given combination.

In other words, from our previous example, we are going to try the 32-?-63 combination first.

To begin abbreviated dialing, the number found using the Saber Sentry Manipulation Aid as the first number of the combination. Because this number was found while rotating left, it must be entered while rotating left.

For example, our 32-?-63 combination is dialed in L32 R? L63.

Having set up the combination with the unknown in the second position, dial left three times to pick up all the wheels and park at the first number. 32 in our example.

The first wheel is now parked and will not move until we have completed the rest of the process. In our example, all wheels are parked at L32. (Photograph 50.)

50. The first wheel is parked and we're ready to start abbreviated dialing.

To derive a starting point for the unknown number second number, subtract 5 from the first number of the combination. In our example, the num-

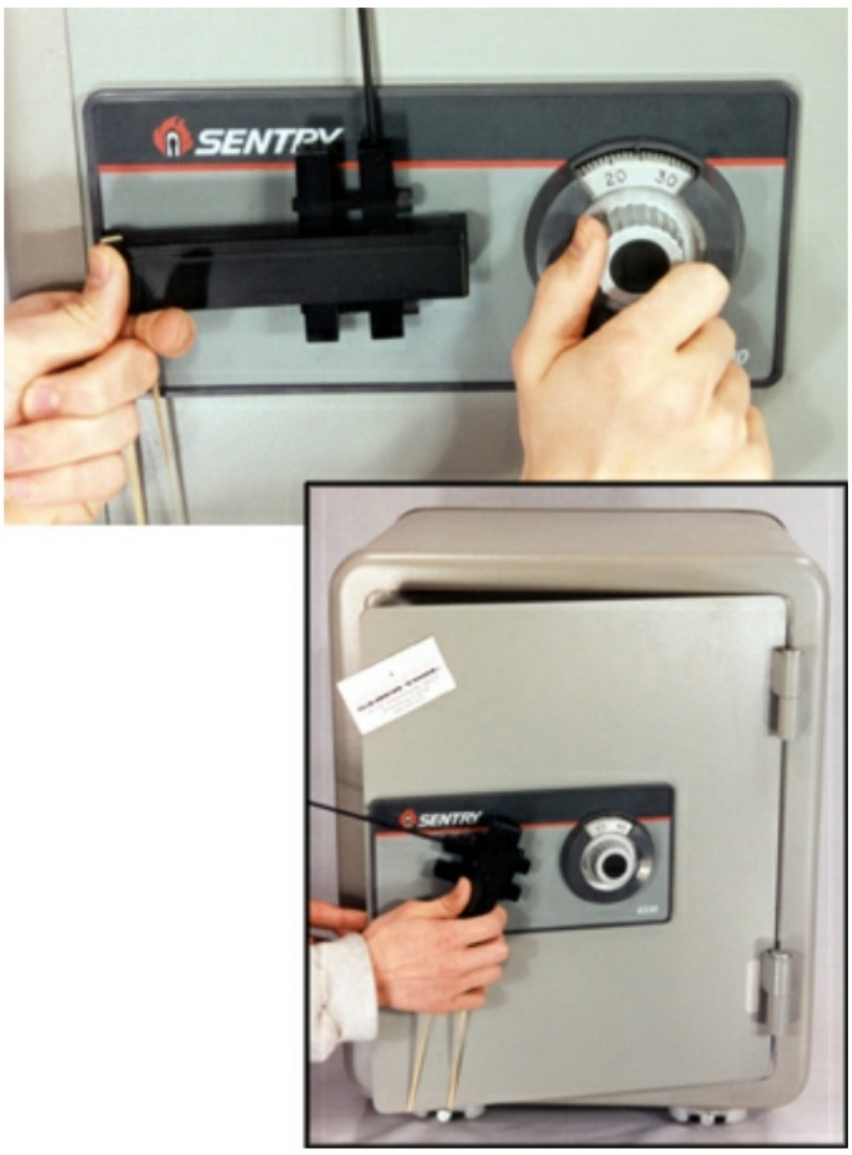
ber is 32-5=27. Our starting point for the second number of the combination, then, is L32 R27 L63.

Rotate the dial right, passing the new second number once and parking on it the second time around. (Photograph 51.) Then dial left to the Drop In and try opening the safe. (Photograph 52.) If that does not work, continue.

51. Dial once past the second number, stopping on it the second time around.

52. Dial left to drop in and try opening the safe.

Subtract 2.5 numbers from the second number and dial directly back right to that number (this is 24.5 in our example). (Photograph 53.) Do not dial past this number on this attempt, or the first wheel will be picked up. Then dial left back to the Drop In. Try opening the safe again. Continue this process, subtracting 2.5 from the second number on all attempts.



53. If the safe does not open, subtract 2.5 numbers from the second number and try again.

Standard Dialing

If the number we found through manipulation was from the first wheel, abbreviated dialing will open the safe in a short time. If abbreviated dialing fails, however, then the number found using the Saber Sentry Manipulation Aid is probably from the second wheel.

In this case we use that number as the second number in the combination and dial out all possible combinations for the first wheel. Remember

that because this number was found while rotating in the left direction, we must continue to use it in the left direction. Because the third number or Drop In is on a direct drive wheel, it can be rotated in either direction.

Using our example, the starting combination looks like this: R? L32 R63. To come up with a starting point on our unknown first number, subtract 5 from the second number of the combination. In our example, the number is 32-5=27. Our starting point, therefore, is R27 L32 R63.

Dial out the full combination and try the handle. If this does not work, subtract 2.5 numbers from the first number and dial out the full combination again. Continue this process until the safe opens.

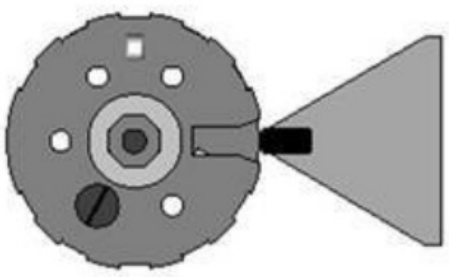
Chapter Six: Changing Combinations

Now that the safe is open, it may be necessary to change the combination. Unlike other lock styles, a combination is not chosen before changing. Instead, the combination is changed and then determined.

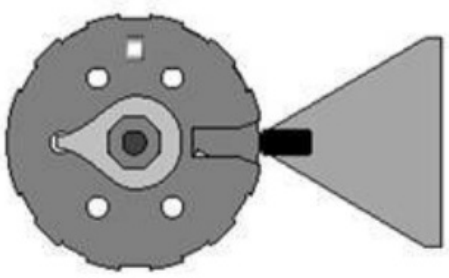
Throughout the years, there have been approximately three minor variations made in changing the Sentry safe combination. The oldest models required a combination change screw that was simply removed and reinstalled at another place on the third wheel. (Illustration 54.)

The next version used a drive cam instead of a screw for changing the combination. In this style safe, the spindle nut was removed and the cam rotated to another position. A tab on the end of the cam engaged the third wheel. The position where the cam engaged the third wheel determined the new combination. (Illustration 55.)

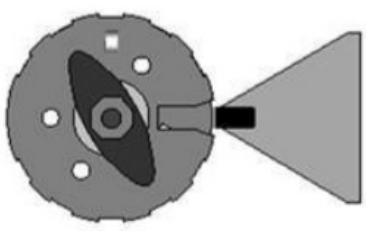
The newest version of the Sentry safe incorporates a wheel pack that is permanently attached to a plastic chassis and spindle tube. To change this style safe, the technician uses his hand to depress the wheel pack. The drive cam is then turned, allowing its posts to engage the third wheel at a different position. (Illustration 56.)



54. Screw Change.



55. Early model drive cam change versions.



56. Current drive cam change version.

With these few variations, changing a Sentry safe combination is relatively easy:

1. Open the safe and remove the boltwork cover plate. (Photograph 57.)

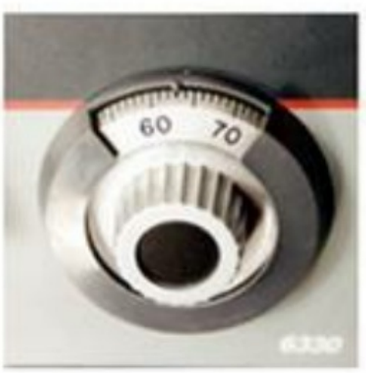
2. Change the position of the combination change screw or drive cam.

3. Using a L-R-L action, align the gates of the wheels with the fence, noting what number is dialed in for each wheel. That is the new combination. (Photograph 58.)

4. Before closing the door, replace the boltwork cover and dial in the combination three or four times to check for proper operation.

57. Remove the boltwork cover plate to gain access to the boltwork.

58. Align the gates in front of the fence, noting the numbers on the dial. This is the new combination.



Chapter Seven: Drilling

Even the best made products cannot stand up to years of abuse and neglect. This, of course, includes the Sentry safe.

In most cases, a Sentry safe can be opened through the manipulation process described earlier. Still, in cases of abuse or vandalism, all the manipulation in the world cannot open a safe. It's at these times that drilling is required. It needs to be made clear, however, that the only sure fix for a drilled Sentry safe is to replace the entire safe. While various methods have been described and used for filling the holes, once the surface has been penetrated, that safe no longer meets the fire standards for which it was designed and tested. Do not leave a customer believing that his safe can be repaired after drilling - REPLACE THE SAFE.

In the Sentry safe, a few common problems can be solved by drilling one or two holes. The most common include the spindle nut falling off or the dial and spindle being removed, the

handle cam nut coming off and the handle coming off of the safe, and materials in the safe accidentally becoming slammed in the door, not allowing the bolt to be retracted.

In cases where the dial and spindle are removed or damaged, we are going to drill a hole in the fence area and move the wheels to align the gates in front of the fence. Once aligned, the handle can be turned to open the safe.

Drilling For The Fence

When drilling for a location on a safe lock, drill points, with some exceptions, are given in relation to the center of spindle and the numbers on the dial.

For instance, let's use the drill point 75-1". With the dial parked with the "0" at the index line, our drill point is located at the number 75, 1" from the center of the spindle. (Illustration 59.)

59. Drill point of 75-1".

To drill for the fence, if possible, remove the escutcheon plate from the safe. The plate is attached by double sided tape and, in most cases, easily removed. On newer style, spy proof dial models, this is not feasible. In this case, either drill through the dial and escutcheon plate or break them away for easier drilling.

If the dial is still in place, for those that have them, remove the small plastic cover at the center of the dial knob. This covers a screw that holds the dial to the spindle. Remove the screw and then the dial. On newer models, it may be necessary to break away the dial and some of the escutcheon plate to remove the dial.

The drill point for a fence attack on a Sentry safe is 75-1". With the dial removed, make a mark at the 75 position (left-and-center of the dial) and 1" from the center of the dial. (Photograph 60.)

60. Remove the escutcheon plate. Mark the 75 position. Remove the dial and measure out 1" from the center of the spindle. This is the drill point.

On newer models, it may not be possible to remove the escutcheon or dial without damaging them. Either carefully break them away, or mark and drill through both the escutcheon plate and dial

On newer models, it may not be possible to remove the escutcheon or dial without damaging them. Either carefully break them away, or mark and drill through both the escutcheon plate and dial

Using a .25" drill bit, drill through the safe door. You now have easy access to the wheels and fence. Using a probe, rotate the wheels such that the gates align with the fence. (Photograph 61.) Turn the handle and open the safe.

61. Once drilled, use a probe to move the gates in front of the fence.

Drilling For The Bolt(s)

In cases where the handle does not or cannot retract the bolt(s) it is necessary to drill from the side of the safe and punch the bolt(s). If the dial is still present and working, make sure to dial in the correct combination first, or, if necessary, drill and align the gates in front of the fence before punching the bolt(s).

There are two style safes currently used by Sentry, the more common single bolt unit and a late model four bolt unit.

The distinguishing points of the single bolt unit include:

1. It is not spring loaded.

2. The handle is always located between the dial and the latch side of the door.

There are three distinguishing points to the four bolt system:

1. It uses the newer style handle, integrated into the escutcheon plate.

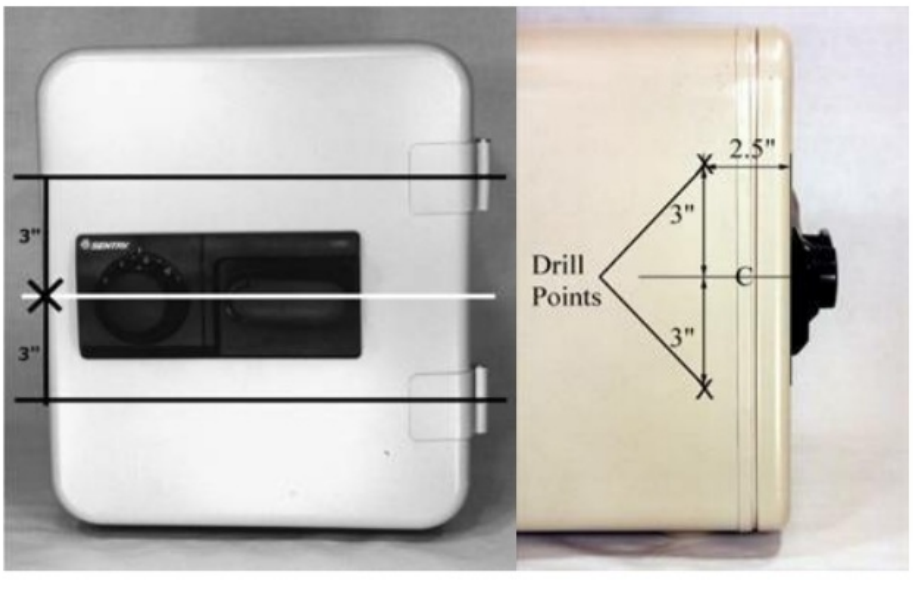
2. It is always spring loaded.

3. The handle is always located between the dial and the hinge side of the door.

In punching the bolt of the single bolt unit, measure directly in line with the horizontal centerline of the dial and 1.75" back into the safe. (Photograph 62.) Drill a .25" hole. Insert the punch and punch the bolt back.

62. Drill point for single bolt Sentry safe bolt.

Punching the bolt of the four bolt unit may require punching each bolt. To do so, measure 3" up and 3" down from the horizontal centerline of the dial. Measure 2.5" back from the face of the door. (Photograph 63.) Drill a .25" hole at each desired spot. Insert the punch and punch each bolt back.



63. Four drill points are needed for the new style four bolt system. Two on each side of the safe.

NOTES:

About Drill Repair

Once the shell of a fire rated container has been penetrated, there is no guarantee that the subsequent repair will meet or exceed the ratings under which the safe was originally built. It is for this reason that Saber Tool Co. does not recommend the repair of a penetrated fire rated container.

About Drill Bit Size

It is the objective of the locksmith to appear as professional as possible. Using a .25" drill bit is optimum for creating a good working hole while maintaining a professional appearance. Larger drills may be used to compensate for poor visibility and other environmental conditions that may leave smaller holes inadequate.